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MAX VON PETTENKOFER'S THEORY OF THE ETIOLOGY OF CHOLERA, TYPHOID FEVER AND OTHER INTESTINAL DISEASES

A REVIEW OF HIS ARGUMENTS AND EVIDENCE

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PREFACE

IN undertaking a study of Pettenkofer's life and work, one is struck by the facts that, first, there is no biography other than the several obituaries and other brief sketches in various journals, and second that as far as can be ascertained no complete bibliography of his writings has been prepared. This is indeed unusual for such exist for so many German investigators whose influence has been far less than that of Pettenkofer. Of his writings, but few translations were published so that in nearly every instance the article in the original German was consulted.

While it was desired to ascertain Pettenkofer's view of the epidemiology of cholera and similar diseases, it was found impossible to consider this phase of his work without also looking into his investigations of other kinds, since much of the work overlapped and a consideration of the entire scope of his activities was necessary in order to gain a proper and sufficiently broad conception of his life, work and beliefs. Thus only does one appreciate the important rôle he played in the moulding of popular opinion and in inspiring other scientific workers. The statements of Emmerich, Gruber and von Voit, Pettenkofer's most eminent assistants and pupils, are taken as authoritative.

Section I consists of a biographic sketch of Pettenkofer together with a brief consideration of his researches along lines other than epidemiological. Section II consists of a consideration of his views as to epidemiology, particularly the epidemiology of cholera, typhoid fever and other diseases of the alimentary tract. There is appended a complete bibliography of Pettenkofer, collected from sources in the Army Medical Library, as well as articles by others which bear on Pettenkofer's opinions. References to these throughout the text are by number.

BIOGRAPHY

Max Pettenkofer was born on December 13, 1818 at Lichtenheim near Neuburg on the Danube in Bavaria. He was one of eight children and his father, a small proprietor, had difficulty in providing for the large family. Therefore the uncle of the future scientist, Dr. Franz X. Pettenkofer, a chemist of note, took his nephew, then aged nine, into his home in Munich and directed his studies. Naturally the boy became interested in chemistry and thus from his earliest childhood he developed a taste for minute analysis and careful enquiry into the laws which govern the phenomena of nature. His uncle was court apothecary and young Pettenkofer was taken into the establishment as apprentice. He attended in turn the *Volksschule*, the Latin school and the *Gymnasium*, where he completed his course with distinction in 1837. In the same year he entered the University of Munich with the intention of studying philology, but, probably owing to his connection with the court apothecary, his purpose was altered and he undertook the study of chemistry. He wrote verses, especially sonnets, a collection of which was published in 1886.[202] All went well until a dispute with his uncle caused him suddenly to leave the latter's house. Without resources, the youth of twenty years was unable to earn a livelihood as a chemist so that, partly for want of a better occupation and partly on account of a return of an old love for literature and art, he became an actor. He played several rôles in Ratisbon, where the press commented most favorably on his histrionic ability. He might have continued this life had not his cousin, Helene Pettenkofer, whom he afterwards married, effected a reconciliation with his stern uncle. He then returned to his studies in Munich, now following the courses in the Medical Faculty, always with a strong leaning towards chemistry. The celebrated mineralogist, Johann Nepomuk von Fuchs, recognized his ability and it is probably due to von Fuchs' influence that Pettenkofer accomplished so much in chemistry at such an early age. Indeed, had it not been for his uncle, who planned a career of court apothecary for his nephew and who therefore insisted on his completing his medical course, Pettenkofer would certainly have given all his time to chemistry, and might never have graduated in medicine.

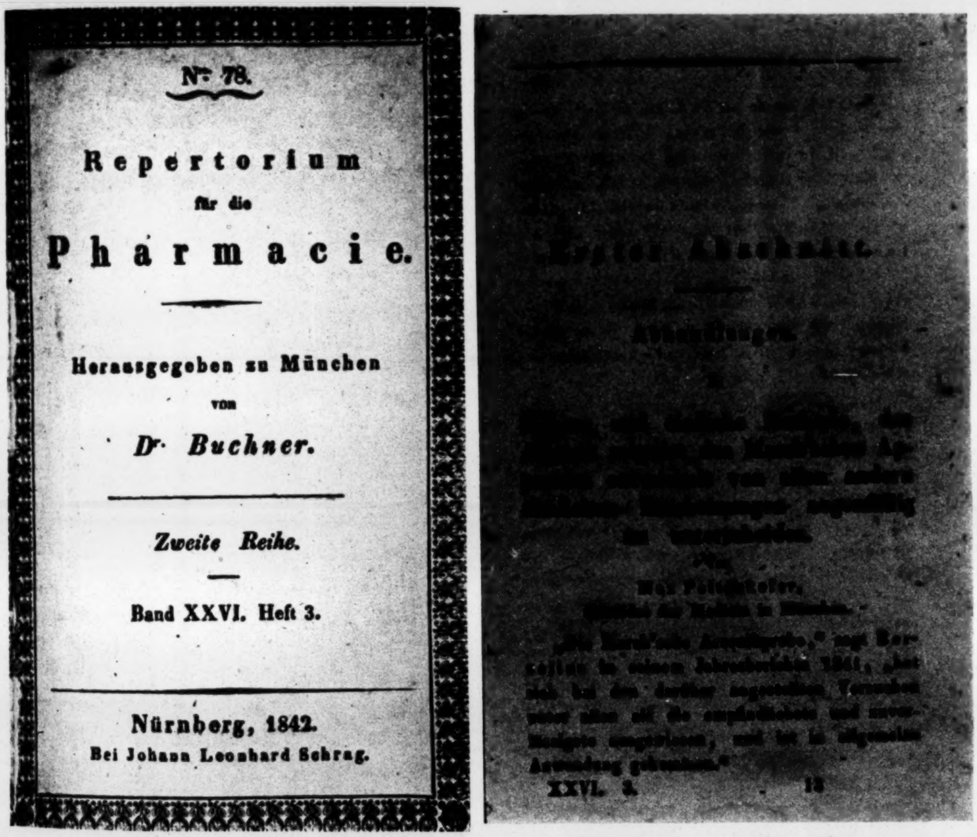
While still a student, Pettenkofer published two researches. The first of these[1] was a valuable method, still used in forensic medicine, for the demonstration of the presence of arsenic by means of the Marsch apparatus. The second article was on the separation of arsenic from antimony, also by means of the Marsch apparatus.[2]

In 1843 Pettenkofer completed his university studies and received the degree of Doctor of Medicine and Surgery. His graduating thesis[4] was on the South American plant *Mikania Guaco.*

The preference for the study of chemistry which had characterized his university course now became even more marked, but he directed his attention more particularly to chemistry in its medical aspects.[11] He had neither inclination nor talent for the practice of medicine. Nevertheless his medical studies stood him in good stead later in his epidemiological work.

At this time there was no institute in Munich where chemical and physical research could be carried out. In this respect Munich was somewhat behind the other German universities. Chemical study centered in the University of Giessen, where Liebig drew to his laboratory all who aspired to prosecute chemical research. There was no vacancy with Liebig just then, so that upon the advice of Fuchs, Pettenkofer went to Würzburg to work with Josef Scherer, who was among the first to recognize the value of connecting chemistry and physiology and was in a way one of the founders of what is now physiological chemistry.

Pettenkofer carried out several pieces of chemical research in Würzburg. One of the first was the demonstration of hippuric acid[5] in the urine and of its relation to food. The most important of these researches was the discovery of the principle named after him, Pettenkofer's test for bile,[7] a discovery which has been, and still is, of the greatest importance to the chemist, the physiologist and the physician. This discovery, Voit tells us, was not the result of chance as is so often stated, but came of clear logic and careful observation (Voit, p. 13).[275] Prior to this test there were no means of recognizing the presence of the bile salts, but by Pettenkofer's well-known test even the minutest quantities are demonstrable.



Nº 78.

Repertorium
für die
Pharmacie.

Herausgegeben zu München
von
Dr. Buchner.

Zweite Reihe.

Band XXVI. Heft 3.

Nürnberg, 1842.
Bei Johann Leonhard Schrag.

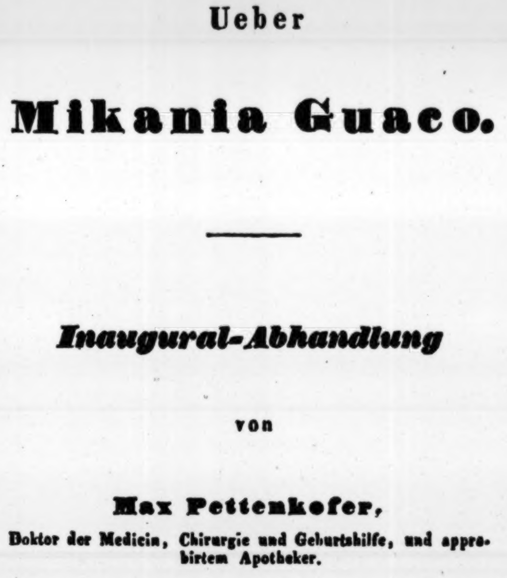
XXVI. 3. 13

TITLE PAGE OF PETTENKOFER'S FIRST PUBLICATION. PUBLISHED WHILE A STUDENT, 1842.

Of almost equal importance was his discovery of a new nitrogenous product in the urine.[6] This research was begun in Würzburg but finished in Giessen in the summer of 1844. The substance was clearly demonstrated and described and Pettenkofer made an elementary analysis of it. Yet Liebig in his great work on the constitution of urine (1843),[258] takes no notice of it although it had caused no little comment. However in 1847, when Liebig published his "Chemical Study of Meat"[259] he showed that the substance was a combination of creatin and creatinin. Thus was shown for the first time the fate of the creatin of the muscles.

In the summer of 1844, Pettenkofer was finally able to go to Giessen to work under the guidance of the renowned Liebig.[142] During this time, he acquired the viewpoint to which he adhered ever afterwards. Liebig was a wonderful teacher who, Pettenkofer said, instead of the aphorism of Mephisto: "Das Beste, was du wissen kannst, darfst du den Buben doch nicht sagen," insisted that "Alles was ich machen kann, das müssen auch die Buben machen lernen." (Voit, p. 15.)[275]

Gladly would Pettenkofer have remained longer in such happy surroundings but lack of ready funds made it necessary for him to return to Munich. No professorship being open, thanks to ministerial opposition, he performed the chemical analysis for the hospital without pay for six months. Finally being forced to undertake some sort of remunerative work, he obtained by accident, in 1845, the position of assistant in the royal mint, at a salary of 1½ *gulden* (60 cents) per day.



Ueber

Mikania Guaco.

Inaugural-Abhandlung

von

Max Pettenkofer,
Doktor der Medicin, Chirurgie und Geburtshilfe, und approbirtem Apotheker.

München, 1844.
Druck der Dr. C. Wolfschen Buchdruckerei.

TITLE PAGE OF PETTENKOFER'S THESIS FOR HIS DOCTORATE, 1844.

He took much interest in this work at the mint[9] where his natural talent for research showed itself to advantage and enabled him to introduce an improvement in the method of assaying silver and gold.[10] He found that the *Brabant* or *Crown Thaler* always contained a large percentage of platinum[20] and that this mixture, theretofore unsuspected, was the chief cause of many difficulties with which the refiner had to contend. His work not only improved the coins[17] but resulted in a saving of valuable metals.[13]

While employed in the mint Pettenkofer carried on a certain amount of research not connected with his official work. He proved definitely that the saliva contains sulphocyanic acid.[8] This had been stated by some, but others insisted that the compound, which reacted like sulphocyanic acid, was really acetic acid which with ferric chloride gives the same red color. Pettenkofer made a quantitative estimation of the sulphocyanic acid. Another bit of research at this time was the demonstration of a new substance in the urine, which is now known as oxyproteic acid.

A third noteworthy study made during this period was upon *haematinon.*[33] This substance was used in the manufacture of the antique red glass known to the ancients as *porporino.* King Ludwig I was most desirous of having the substance reproduced and sent a commission to Pompeii to study it. Pettenkofer succeeded in reproducing it where others had failed. This success was of the greatest importance to Pettenkofer in that it brought him to the attention of the kings of Bavaria, Ludwig I and his successor Max II.

Up to this time Pettenkofer had been unable to obtain a professorship on account of the continued opposition of the ministry under Abel, and indeed opposing views and the conflicting interests of individuals had seemed to thwart Pettenkofer's every plan. But with the downfall of the Abel cabinet in 1847, conditions changed. A professorship of medical chemistry was created at the University of Munich and Pettenkofer called to fill it. He accepted the honor and on November 27, 1847 became professor at a salary of 700 *gulden* ($280) in money and two measures of wheat and seven measures of rye, per annum. He was expected to carry on pathological-chemical investigation for the clinics and was allotted three rooms in the University building in Ludwigsstrasse.

His first student was Carl von Voit who was associated with him later in so many researches on the physiology and chemistry of respiration, metabolism, etc. (*vide infra*). His lectures were not, like Scherer's lectures in Würzburg, along the lines of medical chemistry, but more like those of Liebig on organic chemistry in its relation to physiology and pathology. He changed the title of these lectures almost every year and it is interesting to note these changes as throwing light on his interests and views in the field of public health. The titles of the course were successively:

Lectures on Dietetic-Physical Chemistry.
Lectures on the Physical-Chemical Basis of Diet and Public Health.
Lectures on the Physical-Chemical Basis of Diet as a part of Sanitary Regulations (Medizinische Polizei).
Lectures on Sanitary Regulations.
Lectures on Sanitary Regulations with Respect to the Physical and Chemical Foundation for the Study of Health.
Lectures on Public Health with Respect to Sanitary Regulations.
Lectures on Public Health for Physicians, Architects and Engineers.
Lectures on Public Health and Sanitary Regulations.
Lectures on Hygiene.

The last title was adopted for the summer semester of 1865 and retained thereafter.

Only once more did Pettenkofer turn his attention to pure chemical investigation. This was in 1846. The results of the work were published in 1850 in an article entitled "Ueber die regelmässigen Abstände der Aequivalentzahlen der sogenannten einfachen Radikale."[21] This work was presented at a session of the Academy.

In 1849, the architect, Leo von Klenze, called Pettenkofer's attention to the superiority of English (Portland) cement over the German product, in that it would set much more quickly. Pettenkofer accordingly set about ascertaining the cause of this difference and attempted to provide a satisfactory German cement. The task was at first entrusted to Hopfgarten, one of Pettenkofer's students[18] who, assisted by Pettenkofer himself, finally perfected the new process and produced a German cement of good quality.[15]

It was at this time that Pettenkofer began his experiments on the manufacture of illuminating gas from wood.[36] This had been many times attempted but without success as wood gas could not compete in illumination value with coal gas. Pettenkofer's efforts to devise a suitable wood gas process were finally successful and he contracted to light the city of Basel. This wood gas process was used for many years in various parts of Europe. It was only given up when the decreasing supply of wood made its cost prohibitive.[23,179]

Thus Pettenkofer, at the age of thirty-three, had a wide reputation as a research chemist, his work on platinum, haematinon, cement and wood gas being known everywhere.

Pettenkofer began his first research in the field of hygiene in 1851. This was a study of the differences in methods of heating buildings by hot air and by means of stoves (furnaces), with regard to the air of the spaces heated.[22] This, like certain earlier work, was undertaken at the request of King Max II. While engaged on this work Pettenkofer demonstrated for the first time the permeability of the walls of our dwellings to air, a fact now universally recognized.

At about this time, Pettenkofer completed several minor pieces of research, the most important of which was probably the preparation of a copper amalgam for use as a dental filling material.[12] In 1851 he made an exact analysis of the water of the Adelheid Spring at Heilbronn in Upper Bavaria.[24]

In the preparation of pyroxalic acid (*Holzessig*) in connection with the manufacture of wood gas, Pettenkofer isolated a by-product which he at first took to be pyrogallic acid but later (1854) found to be pyrotannic acid (*Brenzkatechussäure*). A study of this substance was made the subject of a paper (Voit, p. 34).[275]

In 1850 Pettenkofer's uncle died and shortly thereafter King Max II appointed Pettenkofer court apothecary. This position brought with it an increase in his income and gave him as a residence the house in which he had been brought up. King Max, who was ever desirous of bringing to the University of Munich as many savants as possible, appealed to Pettenkofer to use his good offices to induce Liebig to accept a call to Munich. Liebig had steadfastly declined to leave Giessen but when the matter was urged on him by his former pupil, the celebrated old professor consented. Pettenkofer described his connection with the event in "Wie Justus von Liebig nach München kam."

In 1853 Pettenkofer was made ordinary professor of medical chemistry in the Medical Faculty. In the new Physiological Institute, founded in 1855, Pettenkofer was given a suite of four rooms, where he worked with von Siebold, Bischoff, Harless and von Voit.

The first work in this new laboratory was on the zinc content of the air[34] and the question of how deep a layer of zinc is necessary to prevent oxidation.[35] This work has been of considerable value in preserving the wires used in telegraph lines.

Pettenkofer now continued his work on the study of the air in dwellings, which he had begun in 1854.[39] He took as an indicator the time required for the carbon dioxide of a room to increase or decrease. For this purpose he devised his well-known method[42] for carbon dioxide determination.

He went to Paris to continue his investigations. In 1858, he announced his ideas regarding the natural air change in buildings —the basis of artificial ventilation.[39,44] This was a mighty exposition, full of new ideas and setting forth principles which are still accepted.

In the period 1857–1865, Pettenkofer and his pupils also studied the value and effect of clothing.[74,123]

His observations as a member of the Cholera Commission, of the relationship of the soil to the cholera epidemic of 1854 (see next section) caused Pettenkofer to consider the relationship between the soil and air.[123] He noted that the air does not stop at the ground line, but that the soil is itself a mixture of earth, air and water. By adding water to a volume of earth in a jar, he showed that it takes up over one-third of its volume of air. Pettenkofer's well-known experiment to show the permeability of the soil to air was made by placing a canary bird in a jar between two layers of soil, the upper resting on a wire netting. The bird, requiring about 1⅓ cubic inches of oxygen per hour, lived thus for several days, showing that the air passed through the stratum of soil. Observations of miners who have been imprisoned in shafts confirm this point. The air in the soil is affected by winds, temperature, etc., just as is the air above the ground level. Frozen earth is not comparable to normal soil, since it is no longer capable of taking up air because ice fills the interstices instead of water.

In 1871, Pettenkofer continued his studies of the relation of the air to the soil. He first made estimations of the carbon-dioxide content of ground air, samples being withdrawn by lead pipes, and found that the carbon-dioxide layer in the soil varies in thickness.[115] It is, he said, derived from processes of decomposition of living organisms. If his hypothesis as to the origin of carbon dioxide were correct, there would be no more of it in a vegetationless soil than in the air above the surface of the ground.[121] To prove this he made a series of examinations of the carbon dioxide in the soil of the Libyan desert, being assisted by von Zittel in the work. They found, as Pettenkofer had expected, that the carbon dioxide in the soil was not greater in extent than in the air above.[152]

One of the two greatest pieces of research done by Pettenkofer, other than in the field of epidemiology, was his study of the physiology of respiration,[67] metabolism, nutrition and food values. In this work, which extended over more than twenty years, he was ably assisted by Carl von Voit. (See references 63, 64, 107, 133, 135, 170, 180.) The famous Respiration Chamber[52] was constructed at a cost of over 700 *gulden* ($2800), the expense being defrayed by King Max II.[43,50,51] By means of this apparatus, measured air was admitted to the individual within, while the exhaled air, feces, urine and so forth could be collected and examined. (See Ref. 54, 55, 60, 63, 64, 69, 70, 73, 86, 93, 94, 133, 140.) These were the first studies of metabolism in health and disease. (See Ref. 76, 85, 98, 106, 107.) Space will not permit here a full account of all phases of this research of Pettenkofer and von Voit, which was conducted by von Voit alone when Pettenkofer's attention was claimed by his studies in epidemiology.

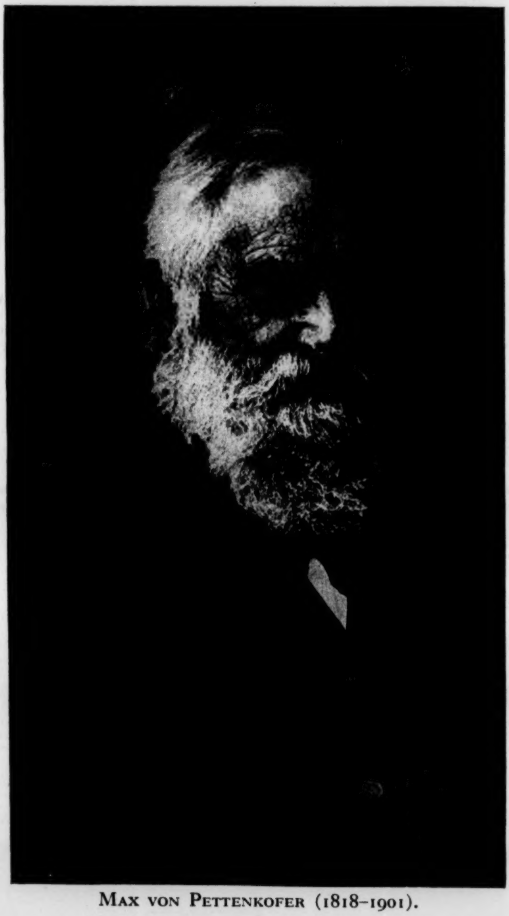
Pettenkofer assisted in the reestablishment of the use of meat extract. This had long been known and had been first used for wounded patients as early as 1821. Liebig had devised a process for its manufacture in South America from beef. Pettenkofer persuaded his uncle to carry it in the court pharmacy and list it in the Bavarian pharmacopeia. When Liebig came to Munich, the name "Liebig's Meat Extract" was officially adopted. In 1862, the plant for its production opened at Fray Bentos in South America and from this the Liebig Fleisch Extract Compagnie developed. Within a comparatively brief time, by applying the method of Liebig and Pettenkofer, 1500 cattle were used daily.[139]

In 1863, at the instance of Friedrich Pecht, Pettenkofer worked out a method of restoring oil paintings. The increasing damage to paintings in the galleries of Munich had become alarming, so that Pettenkofer was appointed one of a commission to study the cause and suggest a remedy. In this he was successful. This single piece of work, von Voit (Ref. 275, p. 64) observes, would have been sufficient alone to have won him world fame. The trouble lay in the formation of a sort of mildew or mould (*Schimmel*) on the paintings. This caused the varnish to become opaque, thus giving the paintings a cloudy, blurred appearance. Pettenkofer made a chemical investigation of the oils, pigments and so forth and found that the fault lay with the oil in which the pigments were dissolved. It underwent a change in the course of time, due to the taking up of oxygen from the air and resulting in a hardening and loss of translucence. This came about by a condensation of water vapor on the surface, while a resulting molecular change in the varnish brought about cracking of the surface. Pettenkofer observed that these defects occurred only in damp museums and galleries. He produced the changes experimentally. The remedy was also suggested by him: by dint of application of hot alcohol vapor, the cracked varnish fragments were united, rendered translucent and the painting made clear again. Naturally to prevent the formation of this mildewing, it is only necessary to prevent the precipitation of water on the painting, as Pettenkofer showed. The Bavarian government appropriated 40,000 *gulden* to carry out the restoration of the paintings already damaged.

From this time forth, Pettenkofer's attention was occupied chiefly by the study of the epidemiology of cholera and other intestinal diseases, but nevertheless he found time for a certain amount of other study and research. A good part of this was on the subject of respiration and, as before, was done in collaboration with von Voit.

Pettenkofer realized the value of educating the general public on the subject of public health as a hygienic measure. He was much in favor of popular lectures for this purpose and gave many in Munich and elsewhere.[158] At that time, many of the leaders of scientific thought felt it beneath them to lecture to other than students of science. In a lecture delivered in 1873 before the Verein für Volksbildung in Munich, on the value of health to the city, he begins: "Everyone who lives upon the earth desires to be well, for a life without health is a misery—a martyrdom from which everyone longs for release, and when it may not be by other means, even by death."[130]

He called the attention of the city of Munich to the financial saving resulting from improved health of the people, due to sanitary reforms, in which he had himself taken such an active part. The money value of the working time lost he estimated at 3,400,000 *gulden* annually for the city of Munich (population then 170,000). Pettenkofer added that if Munich would bring its sanitation up to the standard of London, where the death rate of 42 per 1000 which had prevailed since 1681, fell to 22 per 1000 in 1856, there would be a saving of 25,000,000 *gulden* each year.[89] (Voit,[275] p. 127.)



Max von Pettenkofer (1818–1901).

He said that it was worth the municipality's while to install sewer connections at public expense for those who were unable to pay for them.

Sanitation, says Emmerich, had come to be regarded as consisting of good sewerage, satisfactory toilets and a proper water supply. Pettenkofer recognized the value of all these but stated that the public health depends on a combination of all factors which in any way influence man. Among other factors he mentioned food and air, the preservation of body warmth and good living conditions, such as ventilation: He pointed to England, where drafts are less feared than in Germany, and said that their better health is partly due to penchant for fresh air. Dirt (*Schmutz*) he says must not be tolerated. He was inclined to agree with Lord Palmerston in defining dirt as "everything which is not found in its proper place." (Voit,[275] p. 128.)

Pettenkofer deplored the extensive German abuse of alcoholic drinks, claiming that the deleterious effects manifest themselves in the entire people.[200] He was in favor of temperance if not actual prohibition. The Münchner Verein gegen Missbrauch Alkoholischer Getränke received much assistance from him. In 1899 they erected, in his honor, the Pettenkofer Fountain in the building of the Academy of Medicine.

Just as condiments make food taste better, so Pettenkofer said that anything in nature that makes life more pleasant is valuable. In 1877, he wrote "Ueber den hygienischen Werth von Pflanzen und Pflanzungen im Zimmer und im Freien." Herein he endeavored to answer those who said that plants and the like were useless to the city. He admitted that the old idea of plants purifying the air and acting as the "lungs of the city" was groundless but yet said that they are of value since they tend to purify the soil, to offer shade, which is of real hygienic worth, and not least, in that they are of esthetic value and beautify their surroundings, something not unimportant from the hygienic standpoint.

Pettenkofer always believed that hygiene should be an independent department in the university and urged this again and again. Opinion was not in his favor at first, but he won over more and more of the faculty, although he could never get a majority of the Academic Senate. However, in 1864–1865 when Pettenkofer was rector of the University of Munich, the youthful King Ludwig II in an audience with him asked if he had no personal request to make. Pettenkofer replied with a request that hygiene be made a full chair in all the Bavarian universities. The king at once summoned the minister of education and a conference was held. The result was that, in 1865, an order was issued that hygiene was to be a full subject and required in the medical examinations at the three Bavarian universities (Voit,[275] p. 132). Pettenkofer was accordingly made the first professor of hygiene at Munich. At the same time, Scherer and Gorup-Besanez were given the chairs at Würzburg and Erlangen respectively. It is interesting to note that all three were, like Pasteur, chemists.

There were at first many difficulties in the path of the study of hygiene. Its scope was too restricted and some wanted it taught as an appendage of other studies, e. g., state medicine. Prior to Pettenkofer, hygiene was merely a collection of empirical statements, would-be truths, and mere opinions as to what was harmful to man. There was no possible relation between such ideas and Pettenkofer's own conception of hygiene. In order to set forth his views, Pettenkofer presented a carefully worked out series of lectures, the titles of which are of interest in this connection and because they constituted the first regular course in hygiene. They were:

1. The Atmosphere and its Constituents.
2. Physical and Chemical Changes in the Atmosphere; Atmospheric Climate.
3. Clothing and Care of the Skin; Care of the Body; Exercise.
4. The Retention by Building Materials, of Air, Water and Heat.
5. Ventilation.
6. Heating.
7. Lighting.
8. Building Sites and Building Grounds.
9. Ground Air and Ground Water.
10. Influence of Soil Conditions on the Occurrence and Spread of True Diseases as well as Means of Protection against Them: Local Climate.
11. Drinking Water and the Care of Human Habitations.
12. Food and Its Relationships.
13. Milk, Meat, Bread, Vegetables, Fruits and Other Plant Foods. Alcoholic Drinks, Vinegar.
14. Nutrition and Care of Various Classes of Society under Varied Conditions.
15. Collection and Disposal of Feces and Other Refuse of the Home and Factory; Sewerage.
16. Disinfection.
17. The Coroner and Burial Regulations.
18. Health in Dangerous Trades and Factories.
19. Schools, Barracks, Nursing Institutions, Hospitals, Prisons.
20. Poisons and Regulations for the Care and Handling of the Same.
21. Medical Statistics and Biostatistics.

As there were at that time no textbooks or journals of hygiene, Pettenkofer published his articles in such periodicals as Dingler's *Polytechnisches Journal*, *Abhandlungen der Naturwissenschaftlich-technischen Kommission*, *Kunst-und Gewerbeblatt*, *Sitzungsberichte* or *Gelehrte Anzeiger der Akademie*, *Aerztliches Intelligenzblatt*, etc. The journals of pure chemistry or physics had no space for such material. Therefore his first work in hygiene was little known.

In 1865 Pettenkofer and Voit founded the *Zeitschrift für Biologie*, in which his labors, for the next eighteen years, were collected. With the further development of hygiene as a subject in all the German universities, a journal for this specialty was needed. Pettenkofer and some of his pupils founded the *Archiv der Hygiene*, the first periodical in the world devoted entirely to this subject.

After the appointment of the professors of hygiene in the Bavarian universities, those in the other German institutions followed, the first being Meissner at Göttingen. In 1883, hygiene was required for all examinations in the German empire.

There was, at first, no laboratory for students of hygiene in Munich, and they were accommodated in a small part of the Physiological Institute. In 1872, Pettenkofer received a call to the University of Vienna and consented to remain in Munich only on condition that they would build a Hygienic Institute similar to the one offered him at Vienna. This the Bavarian government consented to do.

The Hygienic Institute was opened in 1878, being the first hygienic laboratory and serving as a model for many later ones. It must not be forgotten, however, that in Great Britain prior to this time military surgeons had received instruction in hygiene and a laboratory under Parkes was in use. It was, of course, much less extensive than the Hygienic Institute of Munich.

Students from all countries now came to Munich to study hygiene with Pettenkofer, just as in his youth all those desiring instruction in chemistry had gone to Liebig in Giessen.

In 1876, Pettenkofer was offered the appointment as head of the newly created German Empire Health Council. This recognition of his standing was deeply appreciated by Pettenkofer but he declined the office because he thought he could render more important service in teaching. He, however, became a scientific adviser to the Council.

Pettenkofer always strove to improve the general health conditions in Munich, but for a long time received but little support. Finally he was able to interest the burgomaster, Alois von Erhardt, and the city architect, Arnold von Zenetti. Clean water was brought in sufficient quantity into the city from the mountains and furnished to all houses. The Central Abbatoir was established in 1878. The disposal of excreta was the hardest problem.[104,221] In the same year, Pettenkofer and his pupil Emmerich showed that the water from the Isar remained good even though there were sewer pipes in the ground. This had been doubted. It was also shown that the sewage could be discharged into the swift Isar[155] without danger since the dilution was so great.[213] (Voit,[275] p. 143.)

With these steps the great cleaning up of Munich began. The result was that the general mortality of 40 per 1000 of 1870 fell to 30 per 1000 in 1890 and the mortality from typhoid fever from 72 per 100,000 in 1880 to 14 in 1898. Munich became and has remained one of the healthiest of cities. Not only was the sanitation improved but better buildings were constructed. Municipal pride was aroused and Pettenkofer became the most beloved citizen of Munich.

In 1872 he was made *Ehrenbürger* and, in 1893, on the fiftieth anniversary of his doctorate, he received the Gold Burgess Medal, the highest honor in the gift of the city. It was inscribed: "Als Beweis der unendlichen Liebe und Verehrung der Münchner Bürgerschaft für ihren Führer auf dem Wege des gesundlichen Fortschritts." On his eighty-first birthday he received a golden medallion bearing his profile and inscribed: "Dem Hohenpriester der Hygiene, dem Verscheucher Verderben bringender Krankheiten vom heimathlichen Boden, dem um das Wohl der Vaterstadt höchst verdienten Max von Pettenkofer widmen diese goldene Denkmünze als Zeichen unbegrenzter Verehrung, Dankbarkeit und Liebe Münchner Bürger." Findlingstrasse in which he had done his work and where the Hygienic Institute is situated received his name after his death and the large monument to him was erected there.

On the fiftieth anniversary of his doctorate, Burgomaster von Borscht said:

The fountain which sprang from five decades of activity from the depth of scientific foundation did not have its fruitful force limited in its immediate surroundings; it has grown to a mighty stream and has flowed over the whole Fatherland and out over the entire civilized world. There is no progressive city today that has not made an effort to apply Pettenkofer's teachings and there is no civilized country that has not given public health, in Pettenkofer's sense, an important place in its life.

Pettenkofer's merits were recognized by governments and learned societies everywhere. He was given personal nobility, then hereditary nobility and in 1896 the title "Excellency." In 1897 he received the gold Harben Medal of the British Institute of Public Health—notable as he himself said, as coming from the land which led in public hygiene. In 1899 he received the medal of the German Chemical Society for his work on atomic weights. On his seventieth birthday, his pupils presented a marble bust of Pettenkofer by von Rümanns (now in the Hygienic Institute), and the city of Munich gave 10,000 marks as a Pettenkofer Foundation for Hygienic Investigation, while Leipzig contributed 5,000 marks for the same purpose.

In 1890 on the death of Döllinger, Pettenkofer was elected president of the Academy. In 1894 he began to retire from all work. He gave up teaching in that year and two years later resigned as court apothecary. He resigned as president of the Academy in 1899. He continued to live in winter in Munich and in summer on the Starnberger See. Even at the age of eighty-two, he would row his boat about the lake and take long walks in the forests.

But he began to feel that he could no longer think as before and was of no more use to the world and was tired of life and wanted to die. All his family, his wife, two sons and a daughter had predeceased him.

In January, 1901 he had a severe infection of the throat which caused him much pain and a pronounced melancholia made its appearance. (At autopsy advanced chronic meningitis with considerable calcification was found.)

In 1889 he had written about Soyka of Prague, his former pupil, who killed himself in an attack of melancholia. "Suicide is no heroic death, and only to be condoned when it is for the benefit of loved ones or when done by one irresponsible. In such a case it is a tragedy." (Voit,[275] p. 160.)

He ended his life just after midnight on February 10, 1901 by a revolver shot. (Gruber,[246] p. 7.)

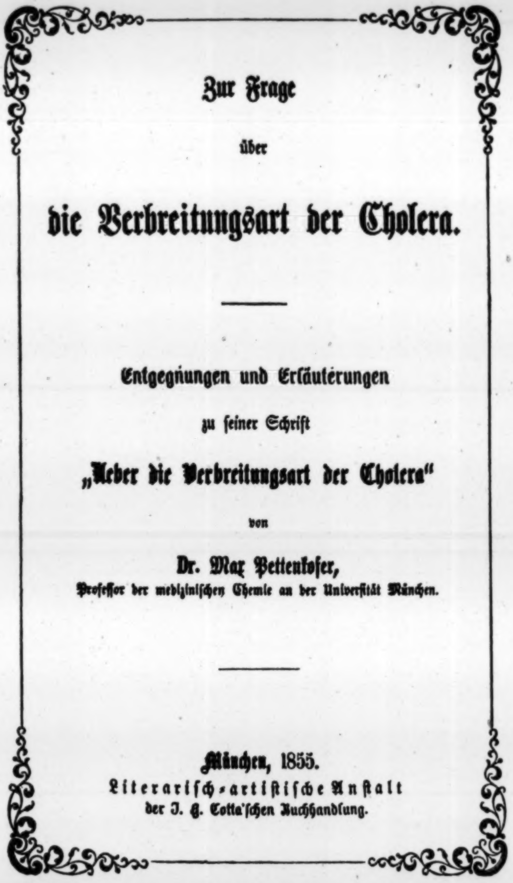
ETIOLOGY OF CHOLERA AND OTHER INTESTINAL DISEASES

I. PETTENKOFER'S THEORY

Briefly stated Pettenkofer's *Boden theory* of cholera is as follows: In order for an epidemic to occur four conditions are essential: (1) a specific germ; (2) certain local conditions; (3) certain seasonal conditions; (4) certain individual conditions.

A specific germ exists but it alone cannot cause the disease so that there can be no direct contagion from person to person. Though individual susceptibility is an important factor, this and the specific germ alone cannot produce the disease. Certain *places* enjoy a complete immunity from cholera and there are also certain *periods* of immunity. Without a consideration of conditions of place and time, it is impossible to account for the development of epidemics and the immunity of places. These seasonal and local variations are intimately connected with the germ itself and do not contribute to the causation of cholera by an influence on individual disposition. The "infecting matter" is not a product of the intestines but of the soil. Thus we must differentiate between the "infecting matter" and the cholera germ. The cholera germ stands in the same relation to the "infecting matter" as the seed does to the fully developed plant. It is possible, if not probable, that the germ is capable of various degrees of development resulting in various degrees of infection.

Pettenkofer's investigations were concerned chiefly with the second and third of the above conditions. The immunity of certain places at all times and a seasonal or temporary immunity of other places is explained by the condition of the soil. A porous soil is necessary for the development of the cholera germ and in it there must be a certain degree of moisture, a certain proportionate mixture of air and water. The level of the ground or subsoil water serves as an index of the water content of the soil (Pettenkofer did not hold that the ground water is itself a factor though he is sometimes misquoted in this regard). In a very damp soil, the cholera germ cannot develop but when the ground water level is lowered, i.e., when some of the moisture of the soil drains out, the cholera germ develops and the epidemic results. On the other hand the cholera germ cannot develop in soil that is too dry. On a soil that is impervious to water there can be no epidemic at all because the germ cannot undergo development in the absence of the proper degree of moisture. Not only must the soil be of the proper degree of dampness, but it must be "foul," i.e., contain decaying organic matter. In this the germ is "ripened." It is this ripened germ which when taken into the human body causes cholera.



Zur Frage
über
die Verbreitungsart der Cholera.

Entgegnungen und Erläuterungen
zu ſeiner Schrift
„Ueber die Verbreitungsart der Cholera"
von
Dr. Max Pettenkofer,
Profeſſor der mediziniſchen Chemie an der Univerſität München.

München, 1855.
Literariſch-artiſtiſche Anſtalt
der J. G. Cotta'ſchen Buchhandlung.

Title Page of Pettenkofer's First Publication on the Etiology of Cholera, 1855.

II. The Specific Germ

When Pettenkofer began his study of the epidemiology of cholera in 1854 there were two main theories regarding the cause of the disease, their adherents being known respectively as *Contagionists* and *Miasmatists*. The contagionists held that the infectious material or *contagium* is procreated in the body of the patient and given off and directly transferred from him to the well individual by the act of touching, as in smallpox. The miasmatists thought that the causative agent or *miasma* exists outside of the body of the patient but only in a definite locality, and that nothing has to pass from the sick to the well individual, as in "intermittent fever." The adherents of each theory cited many examples to uphold their views and to disprove those of the other "school," and for years there were many polemics. The contagionists said that traffic and commerce had an undeniable influence on the spread of the disease, but the miasmatists answered that, in spite of active traffic and undoubted importation of the disease, there are certain places always spared or only attacked at certain times. Some unfortunately decided that the disease could come about in either way.

Pettenkofer early gave his attention to the old question as to whether cholera and typhoid fever are contagious. Although it had long been generally thought that they were, the Bavarian Sanitary Regulations of 1836,[277] on the advice of Philipp von Walther, the clinician, contained this statement: "The contagiousness of cholera patients, even when one lives near and with them or when one touches them and nurses them, is not to be feared." (Voit,[275] p. 76.)

According to the contagionists, the intestinal canal of the patient is the chief seat of the disease and here the infectious material (*Infectionsstoff*), the poisonous germ, is reproduced and increased in amount in the diarrhea. Pettenkofer was at first inclined to agree with this view and even as late as 1865 he thought the most important prophylactic measure was the disinfection of the stools.[83] In 1867, however, he concluded that the fresh stools contain no dangerous matter else the attendants would be overcome in all cases. It is well known, he said, that patients in traveling dispose of their excreta most carelessly and yet even under these circumstances epidemics fail to develop in certain localities. He decided that the disease is neither contagious nor miasmatic; that the error lay in the confusion of the terms *contagious* and *transmissible* (*verschelppbar*). Cholera and typhoid fever are, he thought, transmissible but not contagious, in that they may be transmitted from one locality to another but not from one individual to another. He proposed the elimination of the old terms *contagium* and *miasm* and distinguished the infectious material (*Infectionsstoff*) as "*entogenic*" or *ectogenic*" according as the infectious material passes directly from the sick to the well (entogenic) or the germ or its products develops in the surroundings of the infected person before passing into the economy (ectogenic).[201]

There were two theories as to the mode of spread of cholera. The *ephodists* thought that the specific micro-organism, the cause of cholera, is endemic in lower Bengal from whence it is carried through human intercourse into different localities. It does not thrive outside its endemic locality and the micro-organism must be introduced anew each time in order to cause an epidemic. The *autochthonists* believed that the endemic focus exists in India but that spread of the disease is in no way connected with human travel, being more dependent on conditions in the particular locality and the time. Thus the germ can develop in other places than India (*i.e.*, is autochthonous) but being subject to other conditions it causes epidemics with less regularity and with longer intervals.

Pettenkofer, while in sympathy with the idea of the essential factors of time and place, rejected the theory of the autochthonists, because, he said, it can never be proved that a locality recently attacked with cholera has had no communication with a place where cholera exists, and further evidence tends to show that there is something adhering to persons coming from localities where cholera exists which is capable of spreading the disease in a new spot.

Pettenkofer was therefore an ephodist, but so were the contagionists; he therefore called himself a *Localist*, in that he held that the cholera patients and their excretions are not infectious but that only the local conditions existing at the time are capable of generating an epidemic by favoring the growth of imported infectious matter.

In 1869, Pettenkofer expressed the opinion that both cholera and typhoid fever were caused by specific micro-organisms[105] elaborated in the bodies of the patients and discharged in the evacuations. In his later consideration of the subject, he calls the germ "x" for want of a better name. This germ, he said, may be transmitted not merely by patients themselves but also by well individuals coming from cholera localities. This observation of a condition now explained by the existence of carriers, including those immune from previous attacks, is noteworthy.

In 1883, when Koch demonstrated his *comma bacillus*, Pettenkofer at once accepted his work and stated that Koch had been able to isolate the "x" of which he had written so much. However this, he said, did not solve the problem in any wise for the vibrio alone does not produce cholera and the conditions regarding its spread were known before Koch's discovery. With this statement of Pettenkofer's, there began the conflict between the views of the two men which lasted as long as they lived and was continued by their pupils as late as 1910, when Pettenkofer's assistant, Emmerich, and others published a monograph of some 800 pages on Pettenkofer's *Bodenlehre der Cholera Indica.*[236]

So certain was Pettenkofer of his ground that the vibrio cannot of itself cause cholera, that he resolved to perform what he termed the *experimentum crucis* on his own person, i. e., to swallow the comma bacillus. If this bacillus were the only cause of cholera, he could not escape the disease. Even the bacteriologists were willing to admit this and warned Pettenkofer that his experiment would prove fatal. The experiment was performed on October 7, 1892 when Pettenkofer was seventy-four years of age. He received a fresh agar culture from Professor Gaffky which had been isolated from the rice water stools of a patient dying of cholera in the epidemic then raging in Hamburg. A transfer was made into bouillon and of this Pettenkofer swallowed 1 c.c. on an empty stomach, the acidity of which had been neutralized by sodium bicarbonate. At the time, Pettenkofer called attention to the fact that the number of bacilli swallowed was of course far greater than the number ordinarily taken into the body under normal conditions of exposure. No symptoms resulted except a "light diarrhea with an enormous proliferation of the bacilli in the stools." (Voit,[275] p. 121.)

Whatever we may think of Pettenkofer's reasoning in this regard we cannot help admiring his courage. He had the utmost confidence in his theories so that in his old age we find him ready to make such an experiment on himself. Concerning this he wrote (Voit,[275] p. 121):

> Even if I had deceived myself and the experiment endangered my life, I would have looked Death quietly in the eye for mine would have been no foolish or cowardly suicide; I would have died in the service of science like a soldier on the field of honor. Health and life are, as I have so often said, very great earthly goods but not the highest for man. Man, if he will rise above the animals, must sacrifice both life and health for the higher ideals.

There was naturally manifested the widest interest in Pettenkofer's experiment and his pupil Emmerich repeated it upon himself. It was also carried out by a number of other pupils of Pettenkofer, including Stricker, Metchnikoff, Ferran, and others. (Emmerich,[236] p. 735.) In two cases, a severe "cholerine" resulted, but no deaths. Pettenkofer and his followers made light of the cases of cholerine which they said could not have been cholera for there is a mortality of at least 50 per cent in cholera and none of these cases died. It was generally admitted that Pettenkofer and his associates had escaped cholera but Kruse[255] and a few others thought that they might have had light or atypical cases. Koch and his pupils said that Pettenkofer and the others did not get cholera because they lacked the "personal disposition" to the disease, but von Voit replied that surely one of the number would have been "disposed" to the disease. It was also suggested that possibly the culture that Pettenkofer used consisted of avirulent bacilli, but Pettenkofer replied that it had been isolated but four days previously from a fatal case in Hamburg and moreover the bacilli had increased enormously in the intestinal canals of both Pettenkofer and Emmerich. There was no idea expressed of any acquired immunity or "lack of disposition" to the disease by reason of unsuspected infections by the cholera bacillus in the past on the part of any of those who made the experiment on themselves.

Pettenkofer's experiment brought out one fact of importance for the first time. This was that the ingestion of the vibrio does not necessarily result in cholera. The possibility of immunity gained by an early unrecognized attack was of course not recognized, but it showed that the implantation of the bacilli, like the planting of seeds, does not insure a growth.

III. LOCAL CONDITIONS

At the very outset of his work on cholera, Pettenkofer became interested in the importance of local conditions. While a member of the Cholera Commission in 1854 he prepared a spot map of cholera incidence in Bavaria, using the general staff map. He indicated in red the places in which the disease had appeared in epidemic form; in green those with sporadic cases; and in blue the places in which cholera was present in only one or two houses. This map was not published but is preserved at the Hygienic Institute of Munich. For Munich he prepared a "Record Book" from the official death certificates (almost 2000) showing the street, house and story in which each patient had lived. He desired thus to record the epidemic in such a way that it might be studied later from other viewpoints if desirable. He concluded from his study of the map that: (*a*) The disease was characterized by existence in certain localities with borders often sharply defined; (*b*) The spread was not by preference via channels of travel and commerce, i.e., country roads and railways; (*c*) If in a valley there was a similar condition of the soil from the source to the mouth of the river, localities on the upper part of the stream had been as a rule free from the epidemic which only appeared a long way from the source; (*d*) Places actually on the water shed usually escaped, the epidemic being limited to the river plains; (*e*) Moist and low lying places were in general more often and more severely attacked, than dry or highly situated ones.

Having noted that the epidemic had been more or less confined to the neighborhood of the streams and rivers, he naturally studied the nature of the localities where the epidemic prevailed, and was soon convinced that certain conditions of soil, porosity, moisture and organic pollution, were essential for a widespread occurrence of the disease. This was the beginning of his theory regarding the importance of the condition of the soil (*Bodenbeschaffenheit*) in the occurrence of cholera.

The condition of the soil necessary for the development of the epidemic of cholera depends not on its geological formation, but on its physical condition. A "fouled" soil is essential. This is one which is porous in character, the interstices of which are filled in part at least with organic matter capable of undergoing decomposition in the presence of the proper degree of moisture. Where no process of decomposition is found, i.e., on a stony or compact (impervious) soil there can be no local epidemic of cholera. The idea was not altogether new, for Jameson in describing the cholera epidemics of 1817 and 1819 in India said: "Cholera does not appear to like a rocky soil."[252]

Here again we have an example of Pettenkofer's courage in that he staked his scientific reputation, which was very great, on this point and asserted that nowhere in the whole world could a place be found where a cholera epidemic had occurred where the houses are built on solid rock or other material impervious to water. As an example he cited the city of Nuremberg, where, notwithstanding considerable traffic between the several parts of the city, there were five times as many fatal cases of cholera in the sandy Lorenzer side of the city as in the stony Sebalder side.[201] This relation between the soil and the outbreak of the disease applies not only to localities but even to different houses in the same locality.

Pettenkofer's theory found many opponents and these attempted to answer his arguments by citing instances in which cholera *had* occurred in places situated on rocky or other impervious soil. It does not appear to have occurred to them to question the existence of *any* absolutely impervious soil. Probably any locality if carefully examined would be found to fit Pettenkofer's requirements as to the nature of the soil so that whether an epidemic occurs depends on whether or not its infection be introduced.

Professor Drasche of Vienna[234] wrote in 1860 that he had found a place where an outbreak had occurred despite its situation on rocky soil. This was Krain in the Karst

Mountains in Croatia. Pettenkofer did not attempt to reply but went immediately to investigate for himself. He speaks in the highest terms of Drasche whom he saw in Vienna on the way to Croatia. Drasche had never been to Krain but had based his article on geological maps. Pettenkofer made a study of the soil in six villages near Krain, listing the houses in which cholera had occurred. He found that a large group high up on a steep rocky hill had had no cases although filthy and occupied by the poorest people. On the other hand wherever there had been cases of cholera, Pettenkofer found a high-grade porosity of the soil or a splitting of the subsoil so that the interstices were filled with organic material and retained moisture.[52]

Gibraltar and Malta were also mentioned as exceptions to Pettenkofer's rule for, although on rocky soil, they had been visited by severe cholera epidemics. In 1868, Pettenkofer visited both places. In Gibraltar he found a porous condition of the alluvial soil. The terrain in the upper part of the city was, as in the Karst Mountains, full of clefts and fissures in the rocks. More than two hundred wells were in use and he learned that, just prior to the epidemic of 1865, there had been a marked rise in the ground water level followed by an abrupt decline.[110,111] Malta he found to be a stony island but the crystalline sandstone surface was soft and porous. Twenty-eight per cent of the stone consisted of pores. It was so soft that it could be cut with a knife. Thus Malta instead of being a compact rock was a sort of stony swamp containing a large amount of moist decomposing material.[112]

Similarly when, in 1885, Koch stated that the surface of Bombay and Genoa, where epidemics had occurred, was hard and compact, Pettenkofer showed that his conclusions had been drawn from old and incorrect maps. He further had Settimio Monti, an Italian engineer, investigate the soils and the ground was found to be very foul.

We must admire Pettenkofer's enthusiasm in his being always ready to visit and personally investigate any place that was supposed to possess characteristics that could not be explained by his theory. In this he certainly did not deserve Koch's criticism that he merely distorted facts to prove his theories and did not actually study conditions.

Disinfection. In 1854, Pettenkofer held that the ideal way to stop typhoid fever and cholera was to kill the germ, especially in the excreta, by means of disinfection. As late as 1866, he still placed disinfection at the head of the list of steps that should be taken.[81] In his capacity of *Gesundheitsrath*, 1873,[83] he says nothing further about disinfection, for the epidemic of 1866 had shaken his faith in that measure and he came more and more to the view that neither the fresh nor the old excreta contain the poisonous germ. Even though the "x" be killed in the feces, this would not protect a "disposed locality" which could be infected with the "x" in some other way. Here again he is vague for he does not hazard even a guess as to how this might come about. Therefore he announced that he believed disinfection to be an entirely empirical procedure and one that cannot be measured. He said that in Hamburg they disinfected the excreta and the epidemic stopped and that this was a favorite example of the bacteriologists who overlooked the Munich epidemic, in which the epidemic stopped at the same time of itself without any disinfection.

The supposed rarity of the occurrence of cholera on shipboard was one of Pettenkofer's chief arguments in favor of the essential nature of the local conditions. Ships, he said, resemble immune places on land into which the disease may be brought but no epidemic result.[124,125] In every instance in which cases of cholera were found on board ship, they have been brought from cholera infected localities. In other words, no cases occur in persons who have not been in cholera localities ashore. He gave as an example, the cholera outbreak on the British battleship Britannia lying off Varna in the Crimean War. There were many fatalities among the troops taken on board but none among the crew of the ship. Pettenkofer concluded that the soldiers had come in contact with infectious matter on shore where there was an epidemic, conveyed it on board, and then become ill from cholera in a manner quite comparable with the occurrence of the disease among those who visited an infected locality on shore and then going to a cholera-free place, develop the disease. The crew on the other hand may be likened to the inhabitants of a cholera-free place who do not become infected even though cases of the disease are introduced.

In 1873, of 400 ships carrying 152,000 passengers from infected ports of continental Europe to New York, only four had cases of cholera.[181,183,201] Two ships had one case each, one had three cases and one had four cases. If cholera were contagious and not dependent on certain local conditions, surely, said Pettenkofer, more cases than this would have occurred on board. The few exceptions in which cases did develop on board are explained by Pettenkofer by the assumption that either the cases on shore had brought with them enough infectious material (he does not say how) not only to cause cholera in themselves but in others as well, or else on dirty ships there might be enough soil for the development of the virulence of the germ, thereby resulting in the disease.

This argument is fairly characteristic of Pettenkofer. He was fond of citing a certain number of instances which seemed to prove his point fitting the explanation to these cases. He offers no proof or even a suggestion as to how the individual from the shore who has been exposed to cholera brings with him enough infectious material to communicate the disease to another. It is of course to be borne in mind that Pettenkofer does not admit the possibility of a direct transfer of the disease from one individual to another. Though perhaps unsafe to hazard a guess, it seems almost certain that there must have been records of cholera epidemics on board ships at that time in which the evidence of direct transfer of the "germ" was undeniable.

Pettenkofer believed that in addition to the specific organism causing the disease, which he called "x," there is some other factor in the soil which contributes something to the development of the germ (x) that is essential in order to produce the actual infectious material that causes cholera. He called this factor "Y." It represented to him the local and temporal conditions in the soil. This factor "Y" therefore represents the definite degree of moistening in a porous soil containing decaying organic material. The "Y" is the proper and necessary medium for the development of "x." The process of the union of "x" and "Y" is one of "ripening" (*Reifung*), a procreation of the resistant form of the germ, or as it later came to be called, the evolution of toxicity. The substance resulting from the union of "x" and "Y," Pettenkofer called "z."

In his study of the 1854 epidemic of cholera (Ref. 201, p. 737), Pettenkofer studied each case in detail to ascertain the incubation period. From the records of fatal cases he selected those that fitted into either of the following groups: (*a*) Those cases in which an individual from a heretofore cholera-free locality was suddenly brought into a highly infected cholera neighborhood and after a certain time developed the disease; (*b*) Those cases in which an individual from an infected locality entered a cholera-free neighborhood and thereafter a "contact" (neighbor or member of the same household) became ill with the disease. He found that the time interval in the first group between the arrival of the individual and his development of cholera symptoms was from one to two days, average one and a half day. On the other hand the time of the "contact" case in the second group was from four to fifteen days, average eight and eight-tenths days. From these data he concluded that the infectious material, which results in the spread of the disease and of which man is the carrier, remains in such condition in the human body or is changed by him in some way, that for some days it is inert. Thus the man coming into the cholera neighborhood from a free locality comes down with cholera in one and a half days, but if the material is brought into the cholera-free locality it must remain in the soil some time (average eight and eight-tenths days) before becoming "poisonous." (Ref. 236, p. 114.) Emmerich considered this change in the soil a development of "growth energy" (*Wachtumsenergie*). This he thought to be a development of its nitrous acid productive power. The nitrous acid production is essential to produce fatal cases, but the milder cases might be caused by contact.

The cases selected by Pettenkofer to prove his point were, in the first group, only six of a series of thirty-six cases; in the second group, sixteen from a series of which the number is not given. He does not take the remaining cases into consideration at all. By such methods, cases might have been selected to prove almost any real or supposed epidemiological phenomenon, but this was a practice at which Pettenkofer was an adept.

Nägeli thought that two germs existed, one (the *contagium*) transported from the sick to the well but acting only in the presence of the second (the *miasma*), which is not transportable and is derived from the soil, rendering the individual susceptible to the disease. This was the *diblastic theory* and Pettenkofer was somewhat in sympathy with it as approaching his own, which, in contrast, was sometimes known as the *monoblastic theory*.

Pettenkofer admitted that possibly in rare instances the "x" seems to act without the "y," i.e., by direct passage from the sick to the well. He himself cited instances of this, but added that in his opinion these cases, if sufficiently analyzed, would be found to accord with his theory. Here, he said, we are dealing with the "z" of which but a minute quantity is necessary, or possibly the "x" had found some other factor that had the same effect on it as the "y" from the soil, such as waste material or other filthy substance. Again we feel that there is no condition that Pettenkofer, by some argument or other, could not fit into his theory.

As an additional proof of the essential quality of the "local conditions," Pettenkofer makes the astonishing statement that cross infections never occur in hospitals for cholera patients. That is, cholera never occurs in a patient admitted to such hospital for a condition other than cholera. The only exception is when the hospital is located in a cholera locality (*Cholera-herd*). In such cases the patients admitted for other conditions may develop cholera even though there be no cholera patients in the hospital at all. As an example, he cited the General Hospital at Calcutta which, he said, in spite of the admission of numerous cholera patients, never became a cholera focus. In an endogenous disease like smallpox, many unvaccinated physicians and attendants became infected, but with diseases like cholera and typhoid fever, there is no more to fear than with healthy persons. Nor is there any danger in handling the bodies of those dead of cholera.

The mode of spread of cholera, said Pettenkofer, shows of itself that the disease is not contagious. If it were contagious, it would spread out gradually from a central point via the chief avenues of travel and commerce, i.e., roads, waterways and railways. With the development of the railways its spread would be expected to be accelerated. Pettenkofer said that such was not the case because there are certain communities affected and others spared according only to local conditions.[92] On the other hand, if the disease were contagious there would be no immune places or times. Cunningham reported in India: (1) That despite the frequent introduction of the disease there remained great unaffected areas; (2) that the railroads had not increased the spread of the disease; and (3) that troops infected with cholera do not infect other than "disposed" localities. Similarly the movements of pilgrims and refugees have no effect.[231] Thus also in Europe, through carelessness in 1870–1871, thousands of soldiers with typhoid fever and dysentery were evacuated to all parts of Germany but no epidemic resulted (Voit,[275] p. 81).

In Prussia, during the epidemics of 1848 and 1859, there were twenty times as many persons affected in Posen as in Westphalia (Pettenkofer does not give the numbers). During the same period, similar differences were observed in different parts of Bavaria and Saxony. The epidemic was confined in a marked degree by river sheds and drainage areas. For example, on the great moors south of the Danube in Bavaria there was the greatest difference in neighboring villages with respect to cholera incidence. The low-lying villages were much more severely stricken than those highly situated, thus conforming to Pettenkofer's earlier observations.

Pettenkofer said that Farr, the English statistician,[239] was in error in thinking that the occurrence of cholera had anything to do with the height of the quarter of the city affected. The real determining factor, he said, was of course the condition of the soil. In Gibraltar, Pettenkofer had found that the highest part of the town was the section chiefly attacked, while on the other hand in Malta, the lowest and filthiest (moistest) part of the island was entirely free from the disease.[110,111,112]

Even more striking proof of the effect of the soil, i.e., the local condition, was to be found in the case of the Laufen prison, to which Pettenkofer was especially fond of referring. During the 1873 epidemic, among the inmates of the prison (500 in number), over eighty died, yet the disease did not attack any of the physicians, attendants, nurses, or the guard of sixty-seven soldiers,[149,160] in spite of constant contact. The disease was much more prevalent in the eastern half of the building than the western half. Similarly in the prison in Halle the men's side was affected while the women's side escaped.[233]

Among places which had remained immune, or relatively immune, to cholera notwithstanding commerce, were Multan in the Punjab,[272] Stuttgart,[254] Würzburg,[244] Frankfurt am Main, Salzburg, Innsbruck, Freiburg i S. and a part of Nuremberg as already stated.

To Pettenkofer, cholera patients and commerce with cholera-infested places seemed dangerous only in so far as these might act as a match or tinder to light the flame, but he compared the real danger, the local conditions, to the powder itself, saying that it is better to do away with the actual mine than with the fuse only. The burning match causes no explosion if there is no powder. (Voit,[275] p. 117.)

As Pettenkofer thought that no cholera could result from a direct transfer of the poison from the cholera patient to the healthy person, he considered all quarantine useless.[124] The disease being transmissible, it may be introduced into healthy localities not merely by the sick but also by the well. Thus quarantines are of no avail, for man cannot make a barrier that is germ proof. Besides this, it is an expensive procedure and restricts trade to such an extent that "many people would prefer an epidemic to a long restriction of their means of livelihood." He thought that the money saved by not imposing a quarantine could be used to far better advantage in other sanitary work.

He always laid much stress on the importance of not frightening or exciting the people during an epidemic. One of his chief arguments against the contagionists was that they merely upset the people and made every man fear his neighbor instead of helping him. Here, he said, was one of the valuable influences of the 1836 cholera regulations, which did much good in calming the people by assuring them that cholera is not contagious.[277]

IV. Seasonal Conditions

While some places are always free from cholera, others are free only at times. They may at other times be visited by severe epidemics. Even in places which have a "disposition" to cholera, the disease does not always occur, and when it does occur it is not always with the same severity.

The "temporal disposition" is determined by the amount of moisture in the soil, provided of course that the soil is of the proper type (porous with decaying organic matter in the interstices). The amount of moisture necessary to produce an epidemic is very exact, though Pettenkofer says there is no way of measuring it. The "x" will not develop in a soil that is too moist or too dry. The ground water level is a ready index by which the amount of moisture in the soil may be ascertained. When the ground water level is high, Pettenkofer assumes that the soil is too moist for the cholera germ to develop, but when this level is lowered, the moist subsoil becomes an ideal place for the "ripening" of the "x."

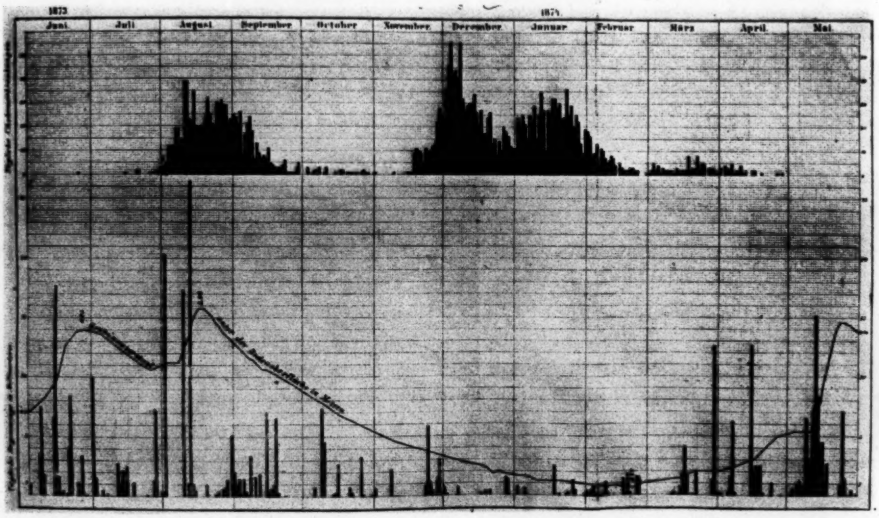
Pettenkofer's conclusions regarding the ground water level and its significance were reached after his study of the 1854 epidemic. Consideration had previously been given to the subject. The Bavarian Academy had in 1762 offered a prize for a discussion of this subject in its relation to agriculture but the report had unfortunately been lost. Pettenkofer, although believing that the germ of cholera is given off in the evacuations of the patient, was at a loss to explain why it is that the disease only occurs at certain times and in certain places, while it seemed probable that the distribution of the germ was much wider than the incidence of the disease. Von Voit tells us that Pettenkofer attempted to account for this variable factor in many ways but finally decided that it must in some way be connected with the changes in the ground water level. He began to measure this change in the wells of Munich by means of pipes set into the soil and also to study the records of former years, showing first that there had been a lowering of the level in the cholera years 1836 and 1854.[78] He, however, warned against the assumption that the conditions existing in Munich prevailed everywhere.

In 1859, he outlined a program for the investigation of the local and temporal conditions affecting the spread of cholera and typhoid fever in various countries, localities and even single houses, based on the official death certificates. He was particularly desirous of studying the conditions of the soil in immune and affected places and also the drinking water in each. The result of his studies was his adoption of the ground water theory and the rejection of the belief that drinking water played a part.

Pettenkofer's arguments regarding the influence of the level of the ground water were greatly strengthened by the observations of Ludwig Buhl in 1865 on the correlation of the fatal cases of typhoid fever in Munich and the lowering of the ground water level.[230] Buhl's paper created much interest especially when his correlation held good for the following year.[129] Pettenkofer's friend, the mathematician Ludwig Seidel, in two papers[267,268] offered evidence that the probability of there being a causal connection between the ground water and the typhoid mortality was to the probability of their being no such connection as 36,000 to 1. This correlation, says Voit, continued to exist in Munich for more than thirty years and only ceased when the purification of the water supply and cleansing (*Verunreiningung*) of the soil by the application of sanitary measures removed this factor. (Voit,[275] p. 85.) Soyka disagreed with Pettenkofer's conception of the reduction of typhoid mortality as being due to the drainage (sewerage) of the soil. He held that it was due to the prevention of the penetration of the causative agent into the soil after the installation of the sewers. (Weyl,[276] p. 200.)

According to Pettenkofer, much light was thrown on the factor of "temporal disposition" by his study of cholera in

India.[117,194] The disease often varies with the time of year and with the rainfall. Even in places where cholera exists at all times (e. g., Calcutta and Bombay) the disease is three times as prevalent in the dry months as in the wet. There is a remarkable parallelism between the cholera incidence and the rainfall, the highest cholera incidence occurring simultaneously with the lowest rainfall. Pettenkofer's explanation was that the excessive rainfall makes the ground too wet for the ripening of the "x" but as the earth dries out the rate goes up. It is quite otherwise in regions where cholera is not endemic (e. g., Lahore). There cholera comes with the rains and decreases as the dry season sets in, August being the time of both the maximum cholera incidence and rainfall. But in Lahore the rainfall is only one third as great as in Calcutta so that in the dry seasons the soil is too dry for the development of the "x," the necessary moisture for which is only to be had with the advent of the rainy season. In Madras there is a double rhythm, i. e., a spring and a summer cholera on account of the character of the local rainfall. The fallacy of an argument like this is apparent. Pettenkofer without having been to India assumes that certain relations exist and fits the conditions to his theory.



PETTENKOFER'S GRAPH SHOWING CHOLERA MORBIDITY AND GROUND WATER LEVEL IN MUNICH, 1873–1874.

There were cases of the importance of the temporal element in Europe also. In Prussia, during the twelve year period 1848–1859, the smallest number of deaths in any month occurred in April. From this time till the middle of September, the number increased 620 fold and then gradually fell off until the middle of March. Similar conditions prevailed in Saxony[84] and Bavaria. In Genoa the epidemics always declined during July and September in spite of the introduction of the germ. The varied rainfall likewise changes the incidence. In Munich the cholera maximum fell in September when the soil was dryest. It is noteworthy that the cholera years 1836, 1854 and 1873 were unusually dry years. In the year 1873–1874 two epidemics occurred. The summer epidemic of 1873 began in the middle of August, declined in September, and by the first of November only a few cases remained and the epidemic was officially declared at an end. However in the middle of November it began anew and the winter epidemic of 1874 was greater than the summer epidemic of 1873. Pettenkofer used this epidemic to illustrate the effect of the temporal factor. In 1873, the ground water level had been quite different from the normal. Usually the highest point was reached in June, after which it declined reaching the low level in January or February. In 1873, the high point was reached in June but thereafter it fell so rapidly that the low point was reached in July. Thereafter increased rainfall caused it to go up again in the middle of August so that the cholera almost disappeared. Then the soil again dried out and cholera recurred. (See graph.) This incidence, said Pettenkofer, is quite like the growth of fungi in the forests, which grow only when the proper degree of moisture is found in the soil. Similarly wooden piles driven into water-covered earth decay only where the air and water meet, i. e., where the correct amount of moisture is found.

Much interest is attached to the places that escape an epidemic on one occasion and are attacked during another epidemic. During the Bavarian epidemic, for example, one section of a barrack in Friesing escaped typhoid fever entirely and the other had many cases, while in a subsequent epidemic the conditions were reversed, i. e., the part formerly free was afflicted while the part that had been exposed escaped. (Voit,[275] p. 90.) Pettenkofer says that there had been some change in the soil conditions but does not say what the change was.

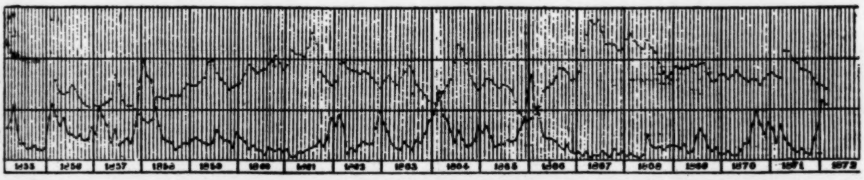
The best example of all was the city of Lyons.[102] This crowded industrial center, situated between two well-known cholera foci, Paris and Marseilles, and in constant communication with them, escaped the epidemics of 1831–1836, 1849 (during which there was an infected regiment quartered in the city), 1865–1866 and 1884. Only in 1854 was Lyons affected by the epidemic (Voit,[275] p. 36). Certainly, said Pettenkofer, the germ must have reached the city and the individual disposition to contract the disease must have existed. The drinking water was no better than that of other cities, or so he assumes, and similarly the soil was not less fouled. It also possessed satisfactory sewers so that some change in the condition of the soil can be the only explanation. As a general rule, he says, the soil at Lyons is unsuitable for the development of cholera epidemics but in 1854 there had been very little rainfall and the level of the Rhône was abnormally low. Thus the soil could develop the degree of dryness necessary for cholera. This explanation would, he said, account also for the existence of a certain number of immune areas in the city, as the soil was not subjected to a uniform rate of drying. It will be noted that while Pettenkofer *says* that the drinking water, soil, etc. were not different from those of some other places, he offers no evidence to prove this.

v. Individual Conditions

There is evidently another factor in the causation of cholera and similar diseases, that of individual susceptibility or "disposition." The disease certainly does not manifest itself in all people alike even under similar conditions. Some individuals seem to be "predisposed." No explanation of this factor was reached by Pettenkofer though he suggested that anything that disturbs the normal physiological processes or impairs the general health predisposes to cholera. Among other contributing factors he suggested that the following might be of importance: advanced age, poverty, weakness, abnormal water content of the body, bad air, unclean water, defective nutrition, dietary errors, bad food, improper clothing, filthiness, physical or mental strain, intemperance, excesses of all kinds, psychic effects, depressing states of mind, fear, and anything productive of diarrhea. (Voit,[275] p. 100.)

vi. The Drinking Water Theory

Pettenkofer's opponents held that the chief medium of transference of the cholera germ was the drinking water. When he first undertook his investigation of the epidemiology of cholera, Pettenkofer was of this opinion himself. But as his work progressed, he got further and further away from this idea. Munich was an excellent place to study this question for there were several private water purification and distribution companies, with patrons side by side. However after a careful house to house survey, Pettenkofer was unable to find any difference in the spread of the disease among the patrons of the several systems. His early decision that drinking water played no rôle in the causation of cholera had an important bearing on his future work in that it directed his studies into other channels, and being convinced that he had settled with the question of drinking water for all time, he spent much valuable time in picking flaws in the arguments of others instead of directing his energies into constructive research in this regard.[184]



A CHART SHOWING THE VARIATION IN THE GROUND WATER AND IN THE MORTALITY FROM TYPHOID FEVER IN MUNICH.

In his well-known report on the water supply of South London and its connection with the cholera epidemic of 1848–1849, John Snow[270,271] showed that there was a great difference in the incidence of the disease between the users of the water of the Lambeth Company, which took in its supply at a distance up the Thames beyond the influence of the tide and out of reach of the sewage of the metropolis, and those of the Southwark & Vauxhall Company, whose water was taken from a part of the Thames which contained the sewage of the city. The users of the waters were intermixed and a comparison of the incidence of the disease between the two groups was illuminating. In the first four weeks of the epidemic, the proportion of deaths among the Lambeth patrons to those among the Southwark & Vauxhall patrons was 1:14. In the next three weeks, it was 1:7.6 and in the last seven weeks 1:4.8. The disproportion naturally decreased as the epidemic progressed on account of the mixing of the people. This epidemiological study of Snow was one of the strongest of the earlier evidences in favor of what Pettenkofer always termed "the drinking water theory." In commenting on Snow's paper, Pettenkofer said that it was in no way a refutation of his theory since the water was naturally used for cleaning purposes and a part must needs have reached the soil. Thus the clean ("x" free) water of the Lambeth Company would not have contaminated the soil, while the foul ("x" containing) water of the Southwark & Vauxhall Company would have done so, thereby resulting in the formation of "z" which caused the cholera (Voit,[275] p. 103). Later on Letheby doubted the accuracy of Snow's observations and attempted to show that there had been considerable confusion, so that a house which was registered in the Lambeth Company really drew its water supply from the mains of the Southwark & Vauxhall Company and vice versa. Pettenkofer received this report of Letheby with great satisfaction and gave it much publicity. (Ref. 192, pp. 198, 863.)

On the other hand, the contagionists replied by citing instances in which there was apparently a connection between the drinking water and the incidence of the intestinal diseases. For example Roveredo in 1845 installed a new water supply and typhoid fever disappeared; to which Pettenkofer replied that in a letter from the local engineer he had been informed that there had been no change in the incidence of the disease (Voit,[275] p. 103). In Elsterberg, in Saxony, typhoid fever and cholera only existed in a certain section of the town where there was a well known to be polluted, while the rest of the town had good water. However, Günther showed that nobody used the polluted water on account of its disagreeable taste (*loc. cit.*). (Emmerich,[236] p. 525.)

In 1865[100,144] typhoid fever disappeared from Munich and all of Pettenkofer's opponents said that it was due to the introduction of the new Thalkirchen water supply which had been installed chiefly on account of Pettenkofer's recommendations. However after this the greatest epidemic of thirty years occurred.[208]

Fort William in Calcutta had had much cholera[261] but after the new sanitary regulations went into effect and the new water supply was used, there was no more cholera. Pettenkofer showed that there had also been other improvements at the same time and that the reduction in cholera actually began before the improvement in the water supply.[195]

In the case of the water of the Broad Street pump in Golden Square, London, to the use of which Snow traced so many cases of cholera in the epidemic of 1854, Pettenkofer's comments were:

> A second instance in London was that with which the name of Dr. Snow is associated. Golden Square, a part of London with very deficient drainage was the scene of a severe epidemic of cholera in 1854. The epidemic concentrated itself in Broad Street. There must have been some reason for this, and the reason must be discovered. Where Golden Square and Broad Street stood was formerly a place for burial for individuals dead of the plague. This pest-blast of a former century could walk from its grave in A. D. 1854 like the Ghost in Hamlet. But a narrower inspection proved that the old pest field and the new cholera field were not exactly coextensive. Now, however, another fact was brought to light, which led to the substitution of the drinking water as the cause. In the middle of Broad Street there stood a pump of which the water was much esteemed on account of its freshness. At the end of August, whilst the cholera was raging, it was found out that many sufferers had drunk of the pump water, but the fact was not sufficiently decisive, and so a pathological experiment was required. In Broad Street there was a percussion cap factory belonging to Mr. Eley. The persons of this establishment suffered from cholera, and many of them died. Mr. Eley remained well, but he did not live at the factory, though he went there daily and returned home to Hampstead after business, and there lived with his mother and niece. His mother, who formerly lived in Broad Street, had a great liking for the water of the pump-well, which was shown in the fact that her son daily took home the water for his mother and niece. In Hampstead there had been no case of cholera until the mother and daughter fell ill and died of cholera without having any other communication with Broad Street than through the means mentioned. What more is wanted? Who can doubt any longer? An experiment on two human beings with a disease which animals are not susceptible to! A sad privilege! Never before had facts received a more frivolous interpretation. Suppose, for a moment, that Mr. Eley had gone to and from Hampstead to Broad Street without having taken the water to his mother and niece; and, further, that they had become ill of the cholera without having drunk the pump water, would it have been imagined that the cholera had been carried by the son, who remained in good health? The contagionists would probably reply that Mr. Eley may have had cholera in a mild form. The localists would say that a poison locally originated might be passed on by healthy people without giving signs of illness in them. In 1854, for example, a young lawyer went from Munich to Darmstadt, where his father resided. Up to that time the father had never lived out of Darmstadt, and Darmstadt was as free from cholera as Hampstead, and the distance from Munich was much greater than Hampstead from Broad Street. The lawyer was as well in health as Mr. Eley had been, but the lawyer's father fell ill and died of cholera. There was no other factor in the case than the return of the son from Munich. Darmstadt enjoyed an immunity from cholera as great as that of Lyons, Versailles, Stuttgardt, and many other large cities. In 1854, a workman went home from the Exhibition of Munich to Darmstadt, where he fell ill and died of cholera without the disease being spread to any other house, and no means for disinfection or isolation had been adopted. In 1866 Prussian troops were quartered in Darmstadt, and brought the cholera with them. About thirty of the soldiers became ill with

cholera, and many of them succumbed; again, none of the inhabitants of Darmstadt had the disease. It must be admitted that Mrs. Eley might have been infected through the intercommunication of her son, just as the lawyer's father had been without the intervention of drinking water. The argument in favour of the drinking water theory rests on the fact that the cholera ceased when the supply of water was cut off; but no notice was taken of the great majority of cases in which the water springs were not closed and the supply of water not cut off, and yet the epidemics came to an end. Again, in Broad Street the pump handle was not taken off till Sept. 8th. Now, an examination of the facts will show that the cholera was already subsiding. In Broad Street, on August 31st, there were 31 cases of cholera; on Sept. 1st, 131 cases; on the 2nd, 125; on the 3rd, 58; on the 4th, 52; on the 5th, 26; on the 6th, 28; on the 7th, 22; and on the 8th, 14. Just as occurs in India and elsewhere, a violent epidemic generally subsides rapidly (Ref. 192, p. 863).

While denying the drinking water theory of cholera, Pettenkofer was of the opinion that bad drinking water is of itself harmful. He said that he was more in favor of pure water than the drinking water theorists themselves, though always insisting that cholera would occur even if the purest of water were used exclusively. He said that the danger from bad water lay not only in its use as a beverage, but also when it was used in cooking, washing, cleansing floors, and so forth. The danger lies, he said, in that the foul water may serve as a medium for pathogenic micro-organisms and that when the water is used repeatedly there accumulates on the surfaces washed enough material to serve as a breeding place (*Brutstätte*) for the pathogenic germs from whence they can infect man. (Voit,[275] p. 106.) He therefore urged that only pure water be used even for such purposes as street cleaning, and so forth, saying that the drinking water theory was not sufficient from a hygienic standpoint but that the localistic theory was more satisfactory since it provided good water for all purposes and not merely for drinking.

The arguments of Pettenkofer and his followers who depended entirely on epidemiological evidence, with Koch and his followers who depended entirely on bacteriological evidence, show how important it is not to view the subject from one angle only. Had either side been less uncompromising science would have been benefited and the interrelationship of the two subjects would have been sooner recognized. But each insisted that the other's conclusions were based merely on coincidences and said that one theory must be accepted in its entirety and the other rejected. Each fell into the error of generalization from a few cases.

The following tabulated comparison of the views of Pettenkofer and of Koch on the epidemiology of cholera is taken from data in Emmerich's monograph:[236]

Pettenkofer's Views	*Koch's Views*
1. The Vibrio of Koch is the cause of cholera.	1. Same.
2. Fatal cholera is not contagious, i. e., is not transmitted directly from man to man by the dejecta and no epidemic can result from the transmission of the dejecta because the same (according to Emmerich) has, by its passage through the intestine, lost some of its toxic properties.	2. Cholera is contagious, and even fatal cholera is transmitted directly from man to man by the dejecta which contain the Vibrio, so that contact may produce "chain infection" and epidemics.
3. The cholera Vibrio develops ectogenously on porous fouled soil at the time when the ground water sinks. The non-toxic cholera bacilli in the dejecta attain their full toxicity in the soil, and only these bacilli from the soil can cause epidemics.	3. Since the typhoid and cholera bacilli are obligate parasites and are only capable of development in the human body, the soil plays no important part. For the occurrence of an epidemic only the cholera bacillus and the susceptible individual are necessary.

4. The spread of cholera depends chiefly on the condition of the soil. There are places with porous soil which are disposed to cholera and there are other places which have rocky or impervious soil which are immune.	4. The spread of cholera as well as the disposition and immunity of certain localities depends not on the soil itself but on personal factors such as general health, habits and customs such as cleanliness in regard to food and drink, etc.
5. Cholera shows a marked seasonal periodicity, for example in Prussia between 1848 and 1859 there were only fifty cases in the first half of April but 31,048 in the first half of Sept., a ratio of 1:620. This can only be explained by external influences such as rain, dryness, temperature, etc. and, according to Emmerich, the production of an upward capillary stream in the soil.	5. The seasonal periodicity of cholera and the increase in the incidence in summer and autumn is due to the fact that people drink more water, eat more fruit and use more ice then so that by reason of gastro-intestinal upsets they are debilitated and more susceptible to cholera.
6. Severe cholera epidemics always fall in times of drought when the ground water sinks. No epidemic can occur in a period of rain. Heavy rains can terminate cholera epidemics by causing the ground water to rise. There are however other causes for the termination of epidemics such as soil immunity from accumulation of metabolic products of the cholera bacillus (Cholerase) in the superficial layers of the soil.	6. The occurrence of cholera epidemics in time of drought is due to the low water level of rivers and the lowering of the ground water in springs so that the dissemination of the cholera bacilli is furthered since the filth is less diluted and the rivers carry it off less quickly.
7. Drinking water plays no rôle in cholera epidemics. The explosive character of epidemics might be accounted for by the sudden development of the "disposition" in the soil of several quarters of a city at the same time.	7. The explosive character of cholera epidemics is explained by the drinking water.
8. The best cholera prophylaxis lies in the removal of the local "disposition" of the porous soil of places attacked, by drainage, water purification, etc. also paving and asphalting of streets, courtyards, etc. The detection of the so-called "first case" is of no importance since if the local and temporal dispositions remain it is impossible to detect all cholera Vibrios.	8. The best weapon for attacking an epidemic is the detection of the first case by bacteriological examination of stools, etc. and the isolation of the same and rendering them harmless.

In discussing the above Emmerich said that only one of the theories can possibly be true, yet in the instruction in hygiene and in the public health practices, an effort was being made to compromise. He thought that Koch had taught nothing new except that the vibrios might be detected in the dejecta. The drinking water theory itself was very old. It is foolish to say that drinking water predisposes one to the disease, else soldiers, bakers and others engaged in trades requiring them to work in hot places, would have a higher incidence than others. Wells are really more fouled (not less so), in rainy weather than in dry. He also denied that the bacilli of cholera and typhoid fever are obligate parasites in that they can live for some time in soil of "disposed" places.

MacNamara reported an instance in the 1861 epidemic in India of nineteen persons who drank the rice water stools from a case of cholera by mistake, five of them becoming ill with cholera. (Ref. 261, p. 196.) Pettenkofer said it was unfair to conclude from this that there is any connection between this act and the disease since the other fourteen persons should be taken into consideration. This is just what Pettenkofer does not do in the majority of his arguments. He frequently selects a number of cases that illustrate some point and ignores the others of the series.

VII. CONCLUSION

Pettenkofer is entitled to a place in the ranks of the great men of science on account of his work in chemistry and physiology which is still accepted. His work in epidemiology, too, is important, but for a different reason. His great hypothesis regarding the etiology of cholera and typhoid fever is no longer tenable but in so forcefully defending his ideas, he stimulated others to great discoveries. His pupils were many and their work has added much to the sum of human knowledge, so that, in a measure, Pettenkofer shines by reflected light. In the final analysis it cannot be denied that he effected a wonderful improvement in Munich, which thereafter served as a model for other cities not merely from the standpoint of beauty but also of health.

Like Pasteur, his versatility was marvelous. It is difficult to find a man who was able to achieve so much in so many totally different fields. He is of course best known as an apostle of good water, fresh air and proper sewage disposal, but it is upon his chemical and physiological studies that his reputation should rest.

His logic was not of the best. He made frequent use of empirical generalization which, however, he condemned in his opponents. He seems withal to have been most conscientious and to have believed thoroughly in his teachings. His willingness to visit any place where conditions prevailed that seemed not to fit into his theory shows an openmindedness that one would otherwise be inclined to doubt at times. He had the courage of his convictions, however, as demonstrated by his experiment in swallowing the cholera bacillus.

It is not easy to criticize his various views since our conception of the problem today is based on other ideas. To verify or refute the facts upon which he relied to prove his arguments, is well nigh impossible after such a long interval of time.

BIBLIOGRAPHY

PUBLICATIONS BY PETTENKOFER

1. Sichere und einfache Methode das Arsenik mittelst des Marsh'schen Apparates entwickelt von allen andern ähnlichen Erscheinungen augenfällig zu unterscheiden. *Buchner's Repert. f. Pharm.*, 1842, LXXVII, 289; 1844, LXXXII, 328.
2. Ueber die Verwendung getrockneter Himbeeren. *Buchner's Repert. f. Pharm.*, 1842, LXXVII.
3. Ueber eine gerichtliche chemische Untersuchung. *Buchner's Repert. f. Pharm.*, 1842, LXXVIII.
4. Ueber Mikania guaco. Diss. Inaug. München, 1844; *Buchner's Repert. f. Pharm.*, 1844, LXXXVI, 289.
5. Ueber eine grosse Menge Hippursäure in Menschenharn. *Liebig's Ann.*, 1844, LII, 86. *Heller's Archiv*, 1845, p. 121. *Journ. de Pharm.*, 1845, VII, 280.
6. Ueber einen neuen stickstoffhaltigen Körper im Harn. *Liebig's Ann.*, 1844, LII, 90. *Heller's Archiv*, 1845, p. 124.
7. Ueber eine neue Reaction auf Galle und Zucker. *Liebig's Ann.*, 1844, LII.
8. Ueber den Schwefelcyangehalt des menschlichen Speichels. *Buchner's Repert. f. Pharm.*, 1846, XCI, 289. *Heller's Archiv*, 1846, p. 464. *Chem. Gaz.*, 1846, IV, 189.
9. Ueber die Anwendung des geschmolzenen Bleizuckers beim Tiegelerzproblem auf Silber und Gold. *Dingler's Polytechn. Journ.*, 1846, C.
10. Ueber die Raffinirung des Goldes und über die grosse Verbreitung des Platins. *Dingler's Polytechn. Journ.*, 1847, CIV. *Münch. Gelehrt. Anzeig.*, 1847, XXIV, 589. *Münch. Bul. Akad.*, 1847, p. 101.
11. Ueber Chemie in ihrem Verhältnisse zur Physiologie und Pathologie. 40 pp. München, 1848.
12. Ueber den amorphen und krystallinischen Zustand eines Kupfer-Amalgams. *Münch. Gelehrt. Anzeig.*, 1848, XXVII, 409. *Dingler's Polytechn. Journ.*, 1848, CIX.
13. Bemerkungen über Platin. *Münch. Bul. Akad.*, 1848, p. 142.

14. Ueber eine neue Trennungsmethode der Phosphorsäure von den alkalischen Erden. *Müncb. Gelebrt. Anzeig.*, 1849, XXIII, 417.
15. Ueber die Unterschiede zwischen den englischen und deutschen hydraulischen Kalken. *Dingler's Polytecbn. J.*, 1849, CXIII. *Müncb. Gelebrt. Anzeig.*, 1849, XXIX, 429. *Müncb. Bul. Akad.*, 1849, p. 233.
16. Vorläufige Notiz über einen neuen Körper, welcher im sogenannten Harnextraktivstoff enthalten ist. *Müncb. Gelebrt. Anzeig.*, 1849, XXVIII, 649. *Müncb. Bul. Akad.* 1849, p. 153.
17. Ueber die Bestandtheile der Schlacken, welche beim Schmelzen des Scheidegoldes mit Salpeter gebildet werden und über deren Benutzung. *Dingler's Polytecbn. J.*, 1849, CXI, 357.
18. Bemerkungen über Hopfgartners Analyse eines englischen und eines deutschen hydraulischen Kalkes. *Dingler's Polytecb. J.*, 1849, CXIII, 357.
19. Betrachtung über die neueste Gährungstheorie. *Müncb. Gelebrt. Anzeig.*, 1849, XXVIII, 681. *Müncb. Bul. Akad.*, 1849, p. 185.
20. Ueber die grosse Verbreitung des Platins und sein Vorkommen in allen güldischen Silbermünzen. *Poggend. Annal.*, 1849, LXXIV, 316. *Rev. scient.*, Par., 1849, V, 231.
21. Ueber die regelmässigen Abstände der Aequivalentzahlen der natürlichen Gruppen der sogenannten einfachen Radikale. *Müncb. Gelebrt. Anzeig.*, 1850, XXX, 261. *Müncb. Bul. Akad.*, 1850, p. 77.
22. Ueber den Unterschied zwischen Offenheizung und Luftheizung in ihrer Einwirkung auf die Zusammensetzung der Luft der beheizten Räume. *Dingler's Polytecb. J.*, 1851, CXIX, 40; 1282.
23. Ueber Leuchtgas aus Holz. *Dingler's Polytecb. J.*, 1851, CXLI.
24. Chemische Untersuchungen der Adelheidsquelle zu Heilbrunn in Oberbayern. *Denkscbr. Müncb. Akad.*, 1851, XXV. *Liebig's Ann.*, 1851, LXXVII, 183.
25. Ueber das Vorkommen der Pyrogallsäure im Holzessig. *Bucbner's Neues Repert. f. Pbarm.*, 1853, II.
26. Ueber das Vorkommen der Gerbsäuren in den Holzpflanzen und deren Zusammenhang mit der Holzbildung. *Bucbner's Neues Repert. f. Pbarm.*, 1854, III.
27. Untersuchung und Beobachtung über Verbreitung der Cholera, nebst Betrachtungen über Massregeln derselben Einhalt zu thun. München, 1855, 374 pp. (Rev. in *Deutscbe Klinik.*, Berl., 1855, VII, 460; 470.)
28. Zur Frage über die Verbreitungsart der Cholera. Entgegnungen und Erläuterungen zu seiner Schrift "Ueber die Verbreitungsart der Cholera." Munchen, 1855. 46 pp.
29. Recherches et considérations sur la mode de propagation du choléra, etc. Munich, 1855.
30. Ueber Weingeistfabrication aus Holz. *Kunst. u. Gewerbeblatt f. Bayern*, 1855.
31. Ueber einen antiken rothen Glasfluss (Hämatinon) und über Aventurin-Glas. *Abbandl. d. naturw.-tecbn. Comm. bei der k. b. Akad. d. Wissenscb.*, München, 1856.
32. De l'Étiologie du choléra. *Gaz. bebd. de méd.*, Par., 1856, III, 219.
33. Ueber Haematinon der Alten und über Aventuringlas. *Abbandl. d. naturw.-tecbn. Comm. bei d. Müncb. Akad.*, 1857, L, 121. *Erdm. J. f. prakt. Cbem.*, 1857, LXXII, 50.
34. Ueber die Verhaltung des Zinks in der Atmosphäre. *Abbandl. d. naturw.-tecbn. Comm. bei d. Müncb. Akad.*, 1857, I, 147. *Dingler's Polytecb. J.*, 1857, CXLV, 296. *Erdm. J. f. prakt. Cbem.*, 1857, LXXII, 185.
35. Ueber ein einfaches Verfahren die Dicke einer Verzinkung auf Eisen zu schätzen. *Abbandl. d. naturw.-tecbn. Comm. bei d. Münch. Akad.*, 1857, I, 159.
36. Ueber die wichtigsten Grundsätze der Bereitung und Benützung des Holzleuchtgases. *Müncb. Gelebrt. Anzeig.*, 1857, XLIV, 425. *Erdm. J. f. prakt. Cbem.*, 1857, LXXI, 385. *Paris Bull. Soc. Encour.*, 1857, LVI, 667.
37. Bemerkungen zu einer Kritik des Hrn. Dr. Eisenmann. *Aerztl. Intellbl.*, 1857, No. xxxi, 1.
38. Beobachtungen über den Stand des Grundwassers. *Aerztl. Intellbl. f. Bayern*, 1857, No. xxxiv.
39. Der Luftwechsel in Wohngebäuden. München, 1858, 126 pp.
40. Eine Reclamation gegenüber Hrn. Dumas' Aequivalentgewichten der einfachen Körper. *Ann. d. Cbem.*, 1858, CV, 187.
41. Ueber die regelmässigen Abstände der Aequivalentzahlen der sogenannten einfachen Radicale. Eine Reclamation gegen Herrn Dumas Aequivalentgewichten der einfachen Körper. *Liebig's Ann.*, 1858, CV, 187.
42. Ueber die Bestimmung des Kohlensäuregehalts der atmosphärischen Luft. *Abbandl. d. naturw.-tecbn. Comm. bei d. Müncb. Akad.*, 1858, II, 1. *Erdm. J. f. prakt. Cbem.*, 1862, LXXXV, 165. *Dingler's Polytecb. J.*, 1862, CLXIII, 53.
43. Berichte über Ventilations-Apparate. *Abbandl. d. Naturw.-tecbn. Comm. bei. d. Münch. Akad.*, 1858, II, 19.
44. Besprechung allgemeiner auf die Ventilation bezüglicher Fragen. *Abbandl. d. naturw.-tecbn. Comm. bei d. Müncb. Akad.*, 1858, II, 69.

45. Ueber den natürlichen Luftwechsel in den Gebäuden und über die Grundsätze der künstlichen Ventilation. *Abhandl. d. naturw.-techn. Comm. bei der k. b. Akad. d. Wissensch.*, München, 1858, II.

46. Fünf Fragen aus der Aetiologie der Cholera. Berlin, J. Blumenthal, 1859, 48 pp. *Monatschr. d. San. Pol.*, Berl. 1859, I, I; 73.

47. Ueber Oelfarbe und Conservirung der Gemälde durch das Regenerations-verfahren. Braunsch., 1850.

48. Ueber die Bestimmung der freien Kohlensäure im Trinkwasser. *Erdm., J. f. prakt. Chem.*, 1860, LXXXII, 32. *Sitzber. Münch. Akad.*, 1860, p. 289.

49. Gegenbemerkungen zu Prof. Lamont's 3. Aufsätze über das Grundwasser. *Aerztl. Intellbl.*, April 14, 1860.

50. Ueber einen neuen Respirationsapparat. *Abhandl. d. Bay. Akad. d. Wissensch.*, 1861, II, CLIX (Part 2).

51. Ueber den Respirations- und Perspirationsapparat im physiologischen Institut zu München. *Sitzber. Münch. Akad.*, 1860, p. 296. *Erdm. J. f. prakt. Chem.*, 1861, LXXXII, 40.

52. Die Cholera und die Bodenbeschaffenheit in der k. k. österreichischen Provinz Krain; mit besonderer Rücksicht auf die Angaben hierüber in Dr. Drasches monographischer Arbeit: "Die epidemische Cholera." 1861. *Aerztl. Int.- Bl.*, Münch., 1861, VIII, 89; 103; 113.

53. Ueber die Erzeugung des salpetrichten Ammoniaks aus Wasser und atmosphärischer Luft unter dem Einflusse der Wärme. *Sitzber. Münch. Akad.*, 1862, II, 45.

54. Ueber die Bestimmung des Wassers bei der Respiration und Perspiration. *Sitzber. Münch. Akad.*, 1862, II, 56.

55. Ueber die Ausscheidung von Wasserstoffgas bei der Ernährung des Hundes mit Fleisch und Stärkemehl oder Zucker. *Sitzber. Münch. Akad.*, 1862, II, 88.

56. Die Bewegung des Grundwassers in München von März bis März 1856–1862. *Sitzber. Münch. Akad.*, 1862, I, 272.

57. Ueber die Bewegung der Messtrommel in der nassen Gasuhr. *Dingler's Polytechn. J.*, 1862, CLXIII.

58. Ueber die Luft in Schulen und über Ermittelung der Grenze zwischen guter und schlechter Zimmerluft. *Kunst u. Gewerbebl. f. Bayern*, 1862.

59. Ueber die Producte der Respiration des Hundes bei Fleischnahrung und über die Gleichung der Einnahmen und Ausgaben des Körpers dabei (with Carl Voit). *Ann. d. Chem.*, 1862, Suppl. 2.

60. Ueber einen neuen Respirationsapparat. *Münch. Abhandl.*, 1863, IX, 231.

61. Ueber die Respiration. *Liebig's Ann.* (Suppl.), I, 1863.

62. Bestimmung des luftförmigen Wassers im Respirationsapparate. *Sitzber. Münch. Akad.*, 1863, XIV, 21.

63. Ueber die Bestimmung des luftförmigen Wassers im Respirations-Apparat. *Sitzber. Münch. Akad.*, 1863, XIV, 152.

64. Ueber Bestimmung des in der Respiration ausgeschiedenen Wasserstoff- und Grubengases. (with Voit). *Sitzber. Münch. Akad.*, 1862, II, 162. *Liebig's Ann.*, 1863, II (Suppl.), 247.

66. Ueber das Studium der Medicinal-Polizei an den Universitäten. *Münch. J. Rösl.*, 1863, 14 pp.

68. Ueber die Produkte der Respiration des Hundes bei Fleischnährung und über Gleichung der Einnahme und Ausgaben des Körpers dabei. (with Voit). *Sitzber. Münch. Akad.*, 1863, 547. *Liebig's Ann.*, 1863 (Suppl.), 361.

69. Ueber die Verlegung der Gottesäcker in Basel. Basel, 1864. 32 pp.

70. Bemerkungen zu den chemischem Untersuchungen von M. J. Reiset über die Respiration von landwirthschaftlichen Hausthieren. *Sitzber. Münch. Akad.*, 1864, I, 207. *Ztschr. f. Biol.*, 1865, I, 38.

71. Die Münchner Pinakotek und ihre Restauration. *Süddeutsche. Zeitung.*, 1864, No. cxvii–cxxx.

72. Zur Restaurationsfrage der Münchner Pinakotek. *Augsburger Allgem. Zeitung*, 1864, No. cxlvi–cxlvii.

73. Description of apparatus for testing the results of perspiration and respiration in the Physiological Institute of Munich. *Smithson. Rep.*, 1864, 235.

74. Ueber die Funktion der Kleider. *Ztschr. f. Biol.*, 1865, I, 180.

75. Ueber dei Wahl der Begräbnissplätze. *Ztschr. f. Biol.*, 1865, I, 45.

76. Ueber das Wesen der Zuckerharnruhr. (with Carl Voit). *Sitzber. Münch. Akad.*, 1865, No. ii, 224.

77. Ueber die Verbreitungsart der Cholera. *Ztschr. f. Biol.*, 1865, I, 322.

78. Ueber den gegenwärtigen Stand des Grundwassers in München. *Ztschr. f. Biol.*, 1865, I, 375.

79. Ueber den Einfluss metallener Wasserleitungsröhren auf die Beschaffenheit des Trinkwassers. *Chem. Centralbl.*, 1865, X, 891. *Dingler's Polytech. J.*, 1865, CLXXV, 283.

80. Die atmosphärischen Niederschläge und die Cholera in Indien. *Beilage zur Allgem. Zeitung*, Nov. 19, 1866.
81. Cholera Regulativ. (With Griessinger and Wunderlich.) München, 1866; Ed. 2. 1867. Dutch translation, Utrecht, 1866. Italian translation, Napoli, 1866.
82. Ueber die Kanalisation der Stadt Basel mit besonderer Rücksicht auf das Bett des Birsig-Flusses. Gutachten im Auftrage wohllöblichen Bau-Kollegiums erstattet. Basel, 1866, 44 pp. *Ztschr. f. Biol.*, 1867, iii.
83. Ueber Disinfection als Massregel gegen Ausbreitung der Cholera. *Augsburger Allg. Ztg.*, 1866, No. xxxv–xxxvi. *N. Repert. d. Pharm.*, Münch., 1866, xv, 97; 545.
84. Die sächsischen Cholera-epidemien des Jahres 1865. *Ztschr. f. Biol.*, 1866, ii, 78.
85. Ueber Kohlensäureausscheidung und Sauerstoffaufnahme während des Wachens und Schlafens beim gesunden und kranken Menschen. (With Voit.) *Sitzber. Münch. Akad.*, 1866, ii, 236. *Annal. Chem. Pharm.*, 1867, cxli, 295.
86. Untersuchungen über den Stoffverbrauch des normalen Menschen. (With Voit). *Ztschr. f. Biol.*, 1866, ii, 459.
87. Gevoelen over disinfectie als maatregel tegen de verspreiding der cholera. Uit het Hoogduitsch door R. J. Opwyrda. Vlaardingen Bruckwilder, 1866.
88. Die Cholera vom Jahre 1866 in Weimar. Weimar, 1867.
89. Ueber Bedeutung der öffentlichen Gesundheitspflege. *Deutsch. Naturf. Tagebl.*, 1867, p. 11.
90. Ueber das Wesen des Ileotyphus. *Deutsch. Naturf. Tagebl.*, 1867, p. 82.
91. Remarks on Typhoid Fever. *Tageblatt. d. Versamml. deutsch. Naturf. u. Aerzte*, Frankf. am Main, 1867, xli, 81.
92. Ueber das Moment der örtlichen und zeitlichen Disposition für Cholera und über den Verlauf der Epidemie in mehreren Städten an der nördlichen Abdachung des Thüringer Waldes im Jahre 1866. *Aerztl. Int. Bl.*, Münch., 1867, xiv, 121.
93. Ueber Kohlensäureausscheidung und Sauerstoffaufnahme beim Menschen (With Voit). *Sitzber. Münch. Akad.*, 1867, No. i, 255.
94. Ueber den Stoffverbrauch eines der Zuckerharnruhr-Kranken. *Sitzber. Münch. Akad.*, 1867, ii, 572.
95. Ueber die Ursachen und Gegenwirkung von Cholera-Epidemien in Erfurt. Erfurt, 1867.
96. Regenmenge und Cholera in Indien und der gegenwärtige Standpunkt der Frage der Choleraverbreitung. *Beilage z. Allgem. Zeit.* 1867, No. lviii–lx.
97. Berichtigungen zu den Verhandlungen der Cholera-Conferenz in Weimar am 28 u. 29 April, 1867. (With Günther). *Ztschr. f. Biol.*, 1867, iii.
98. Ueber den Stoffverbrauch bei der Zuckerharnruhr. (With Voit). *Ztschr. f. Biol.*, 1867, iii, 380.
99. Resultate der Cholera-Conferenz in Weimar. *Bayrische Zeitung*, 1867, vii, 25.
100. Uber die Schwankungen der Typhussterblichkeit in München von 1850 bis 1867. *Ztschr. f. Biol.*, 1868, iv, 1.
101. Die Immunität von Lyon gegen Cholera und das Vorkommen der Cholera auf Seeschiffen. *Ztschr. f. Biol.*, 1868, iv, 400.
102. Die Cholera auf dem Felsen von Malta und Gibraltar. *Beilage zur Allgem. Zeitung*, 1868, vi, 17.
103. Prof. Hallier über den Einfluss des Trinkwassers auf den Darmtyphus in München. *Ztschr. f. Biol.*, 1868, iv, 512.
104. Das Kanal- oder Siel-System in München. Gutachten, abgegeben von der durch den Stadt-Magistrat gewählten Commission: Prof. Dr. Feichtinger, Dr. Frank, Prof. Dr. Pettenkofer, und Prof. Dr. H. Ranke. München, 1869.
105. Boden und Grundwasser in ihren Beziehungen zu Cholera und Typhus. *Ztchr. f. Biol.*, 1869, v, 310.
106. Ueber den Stoffverbrauch bei einem leukämischen Manne. (With Voit.) *Ztschr. f. Biol.*, 1869, v, 319.
107. Respirationsversuche am Hunde bei Hunger und ausschliesslicher Fettzufuhr. (With Voit.) *Ztschr. f. Biol.*, 1869, v, 369.
108. Entgegnung. *Aerztl. Intellbl.* 1869, No. v.
109. Causes of Cholera. *Med. Press & Circ.*, Lond., 1869, vii, 405.
110. Die Choleraepidemie des Jahres 1865 in Gibraltar. *Ztschr. f. Biol.*, 1870, vi, 95.
111. Monatliche Zusammenstellungen über Temperatur und Feuchtigkeit der Luft, Regenmenge und vorherrschende Winde in Gibraltar vom Jahres 1853 bis 1867. *Ztschr. f. Biol.*, 1870, vi, 120.
112. Die Choleraepidemien auf Malta und Gozo. *Ztschr. f. Biol.*, 1870, vi, 143.
113. Bemerkungen zu Dr. Buchanan's Vortrag "On Pettenkofer's Theory, etc." *Ztschr. f. Biol.*, 1870, vi, 513.
114. Beantwortung der Frage: ob nach Maasgabe der Frankfurter Lokalverhältnisse der Einführung der Abtrittsstoffe in die neu erbauten Kanäle vom sanitären Standpunkt aus

Bedenken entgegenstehen? *Ztschr. f. Biol.*, 1870, VI, 544.

115. Ueber den Kohlensäuregehalt der Luft im Geröllboden von München. *Sitzber. Münch. Akad.*, 1870, II, 394.

116. Observations on Dr. Buchanan's lecture on Prof. Pettenkofer's theory of the propagation of cholera and enteric fever. *Med. Times & Gaz.*, Lond., 1870, I, 629; 661; 687.

117. Verbreitungsart der Cholera in Indien. Nebst einem Atlas von 16 Tafeln nach J. Bryden. Braunschw., 1871, 121 pp. *Aerztl. Int. Bl.*, Münch., 1871, XVIII, 614.

118. Typhus und Cholera und Grundwasser in Zürich. *Ztschr. f. Biol.*, 1871, VII, 86.

119. Ueber die Zersetzungsvorgänge im Thierkörper bei Fütterung mit Fleisch. (With Voit.) *Ztschr. f. Biol.*, 1871, VII, 433.

120. Ueber Bestimmung der Kohlensäure in Trinkwasser. *Sitzber. Münch. Akad.*, 1871, p. 170.

121. Ueber Kohlensäuregehalt der Luft im Boden (Grundluft) von München in verschiedenen Tiefen und zu verschiedenen Zeiten. *Sitzber. Münch. Akad.*, 1871, p. 276. *Ztschr. f. Biol.*, 1871, VII, 395; IX, 250. *Chem. Soc. J.*, 1873, XI, 361.

122. Ueber die Aetiologie des Typhus. München, 1872.

123. Beziehungen der Luft zu Kleidung, Wohnung, und Boden. Drei pupuläre Vorlesungen gehalten im Albert-Verein zu Dresden am 21, 23, u. 25 Marz 1872. Braunschw., 1872. 115 pp.

124. Ueber Cholera auf Schiffen und den Zweck der Quarantänen. *Ztschr. f. Biol.*, 1872, VIII, 1.

125. Zur Choleraepidemie auf dem "Renown." *Ztschr. f. Biol.*, 1872, VIII, 294.

126. Ueber den gegenwärtigen Stand der Cholerafrage und über die nächsten Aufgaben zur weiteren Ergründung ihrer Ursachen. *Ztschr. f. Biol.*, 1872, VIII, 492.

127. Auszug aus den Untersuchungen von Dr. Douglas Cunningham in Ostindien, über die Verbreitungsart der Cholera. *Ztschr. f. Biol.*, 1872, VIII.

128. Ueber ein Beispiel von rascher Verbreitung specifisch leichterer Gasschichten in darunter liegenden specifisch schweren. *Sitzber. Münch. Akad.*, 1872, II, 264. *Ztschr. f. Biol.*, 1872, IX, 245.

129. Ueber Bewegung der Typhusfrequenz und des Grundwasserstandes in München. *Sitzber. Münch. Akad.*, 1872, II, 60; 107.

130. Ueber den Werth der Gesundheit für eine Stadt. Braunschw., 1873, 63 pp.

131. Ueber den gegenwärtigen Stand der Cholera-Frage. München, 1873.

132. Was man gegen Cholera thun kann. München, Oldenbourg, 1873. *Indian Med. Ann. Sc.*, Calcutta, 1875, XVII, 1. *Am. Pub. Health Ass. Rep.*, N. Y., 1873, 1875, I, 317.

133. Ueber die Zersetzungsvorgänge im Thierkörper bei Fütterung mit Fleisch und Fett. (With Voit.) *Ztschr. f. Biol.* 1873, IX, 1. *Chem. Soc. J.*, 1873, XI, 1047.

134. Ueber den Kohlensäuregehalt der Grundluft im Geröllboden von München in verschiedenen Tiefen und zu verschiedenen Zeiten. *Ztschr. f. Biol.*, 1873, I, 250.

135. Ueber die Zersetzungsvorgänge im Thierkörper bei Fütterung mit Fleisch und Kohlehydraten und Kohlehydraten allein. (With Voit.) *Ztschr. f. Biol.*, 1873, IX, 435.

136. Der neueste Bericht des Sanitary Commissioner with the Government of India, Dr. James M. Cunningham, über die Cholera-Epidemien. von 1872 in Indien. *Ztschr. f. Biol.*, 1873, IX.

137. Die Grundwasserbeobachtungen in München im Vergleich mit denen in Berlin. *Berl. klin. Wchnschr.*, 1873, No. iii.

138. Untersuchungsplan zur Erforschung der Ursachen der Cholera und deren Verhütung. *Deutsch. Reichsanzeiger*, 1873.

139. Ueber Nahrungsmittel im Allgemeinen, und über den Werth des Fleischextracts als Bestandtheil der menschlichen Nahrung insbesondere. *Ann. Chem. Pharm.*, 1873, CLXVII, 271. Dutch translation, Haarlem, 1873. French translation, Lille, 1873.

140. Ueber die Bedeutung der Kohlehydrate in der Nahrung. (With Voit.) *Sitzber. Münch. Akad.*, 1873, p. 273.

141. The relations of the air to the clothes we wear, the house we live in, and the soil we dwell on. Lond., 1873.

142. Zum Gedächtnis an J. v. Liebig. Braunschw., 1874. 40 pp.

143. Antrag betreffend Einrichtung fortlaufender meteorologischer Beobachtungen in einer Anzahl von Orten Westasiens und Aegyptens. Internat. San. Confer. in Wien, 1874.

144. Ueber die Abnahme der Typhussterblichkeit in der Stadt München und über das Trinkwasser als angebliche Typhusursache. *Deutsch. Vrtljschr. f. öff. Gsndspflg.*, 1874, VI, 233.

145. Ist das Trankwasser Quelle von Typhus-Epidemien? *Ztschr. f. Biol.*, 1874, X, 439.

146. On the recent outbreak of Cholera in Munich. *Med. Times & Gaz.*, 1874, I, 582.

147. Sul modo di propagazione del colera nelle Indie; resultati ottenuti dalle recerche etiologiche piu recente fatte nell'India. *Clinica*, Napoli, 1874, I, 49; 57; 65; 73; 89; 1875, II, 9; 19; 35; 59; 87; 135; 167; 177.

148. Vstupitelnaya raich'k' obsuzhdeny u programmi izslaidovaniya uslovii maistnago i vremennago razvitiya tiphoznikh epidemii. *Zdorovje*, St. Petersb., 1874–5, I, 585.
149. Die Cholera-Epidemie in der k. bayrischen Gefangenanstalt Laufen a. d. Salzach. Bericht der Cholera Kommission für das Deutsche Reich. Berlin, 1875. 108 pp.
150. Künftige Prophylaxis gegen Cholera nach den Vorschlägen in dem amtlichen Berichte des k. bayr. Bezirks- und Stadtgerichtsarztes Dr. Frank. München, 1875. 123 pp. *Tr. San. Rec.*, Lond., 1875, III, 35.
151. Ueber ein Reagens zur Unterscheidung der freien Kohlensäure im Trinkwasser von der an Basen gebundenen. *Ztschr. f. Biol.*, 1875, XI, 308. *Sitzber. Münch. Akad.*, 1875, V, 55.
152. Ueber den Kohlensäuregehalt der Luft in der lybischen Wüste über und unter der Bodenoberflache. *Ztschr. f. Biol.*, 1875, XI, 381. *Sitzber. Münch. Akad.*, 1874, IV, 339. *Chem. Soc. J.*, 1876, I, 891.
153 Die Cholera-Prophylaxis in München von Dr. Frank, besprochen von Pettenkofer. *Aerzt. Int. Bl.*, Münch., 1875, XXII, 370.
154. Cholera, how to prevent it. Lond., 1875.
155. Vorträge über Canalisation und Abfuhr. München, 1876.
156. Schreiben an den Vizepräsidenten der Vorbereitungscommission des IX. internat. statistischen Congresses zu Budapest, betreffend Cholerastatistik. Programm des Congresses. III. Section, Budapest, 1876.
157. Die Cholera 1875 in Syrien und die Cholera-prophylaxe in Europa. *Ztschr. f. Biol.*, 1876, XII, 102.
158. Populäre Vorträge. München, 1877, 255 pp.
159. Outbreak of cholera among convicts. An etiological study of the influence of dwelling, food, drinking-water, occupation, age, state of health, and intercourse upon the course of cholera in a community living in precisely the same circumstances. Lond., 1878. 106 pp.
160. Auftreten und Verlauf der Cholera in dem köngl. bayrischen Strafarbeitshause Rebdorf, in dem köngl. bayrischen Zuchthause Wasserburg und in dem köngl. bayrischen Zuchthause Lichtenau; und die Cholera-Epidemien in den beiden Civil-Krankenhäusern und das Verhalten des Militär-Krankenhauses und der Kasernen von München während der Epidemie 1873–4, nebst Nachtrag zum Berichte über die Cholera-Epidemie in der köngl. bayrischen Gefangenanstalt Laufen. Berlin, 1877. 98 pp.
161. Neun ätiologische und prophylaktische Sätze aus den amtlichen Berichten über die Choleraepidemien in Ostindien und in den Vereinigten Staaten v. N. Amerika. *Deutsche Vrtljschr. f. öff. Gsndspflge.*, Braunschw. 1877, IX, No. 2. English translation, *Practitioner*, Lond., 1877, XVIII, 135; 204.
162. Vorläufige Mittheilung über das Verhalten der Milch auf Thonplatten und über das Verhalten der Casein- und Fettbestimmung in der Milch (Julius Lehmann). *Sitzber. Münch. Akad.*, July 7, 1877, p. 263.
163. Bemerkungen zu einem Bericht des Herrn Briquet an die französiche Akademie der Medicin über die sogenannte Choleraboden-theorie. *Deutsch. med. Wchnschr.*, Berl., 1877, III, 561; 573; 585.
164. Bemerkungen zur Kritik des Hrn. Prof. Wagner über die Vorarbeiten zur Wasserversorgung Münchens, 1877.
165. Trinkwasser und Cholera. *Zeitschr. f. Biol.*, 1878, XIV, 297. French translation. Sur l'étiologie et la prophylaxie du choléra. *Rev. Med. de l'Est*, Nancy, 1878, IX, 67; III.
166. Theorie des natürlichen Luftwechsels von G. Recknagel. *Sitzber. Münch. Akad.*, July 6, 1878, p. 424.
167. Was ist und was will "Gesundheitslehre"? *Gartenlaube*, 1878, No. XX.
168. Ueber Wasserversorgung. *Deutsche Rev.*, 1878.
169. Disinfektion von Schiffen, Bericht über einen Versuch der Disinfektion eines geschlossenen Raumes durch schweflige Säure, durch Verbrennen von Schwefel in der Luft desselben. *Veröffentl. d. k. deutsch. Gandtsamts*, Berl., 1879, III.
170. Zur Frage der Ausscheidung gasförmigen Stickstoffs aus dem Thierkörper. *Sitzber. Münch. Akad.*, 1881, XI, 270. (With Voit). *Ztschr. f. Biol.*, 1880, XVI, 508.
171. Ueber die Bewegung der Luft in den Sielen von München. *Sitzber. Münch. Akad.*, 1881.
172. Cholera und deren Beziehungen zur parasitären Lehre. *Aerztl. Intellbl.*, 1881, No. iv–v.
173. Der Boden und sein Zusammenhang mit der Gesundheit des Menschen. Berlin, 1882.
174. Der Boden und sein Zusammenhang mit der Gesundheit des Menschen. Berlin, 1882, 32 pp. Also Ed. 2.
175. Einleitung: Individuelle Hygiene. Handb. d. Hyg. Pettenkofer und Ziemssen. Leipz., 1882.
176. Das Hygienische Institut der k. b. Ludwigs Max. Univ. München. Braunschw., 1882. Handb. d. Hyg., Leipz., 1882.
177. Einleitung zum Handbuch der Hygiene und der Gewerbekrankheiten von Pettenkofer und Ziemssen. I, No. i, Leipz., 1882.
178. Zur Statistik der Kost-oder Halte-Kinder. *Arch. f. Hyg.*, München & Berl., 1883, I, 49.

179. Beleuchtung des Kgl. Residenztheaters in München mit Gas und mit elektrischem Lichte. *Arch. f. Hyg.*, München & Berl., 1883, I, 384.

180. Einwirkung der schwefelingen Säure (SO_2) in der Athemluft auf den thierischen Organismus. *Sitzber. Münch. Akad.*, 1883, XIII, 449.

181. Ueber die Cholera-Gefahr. *Breslau. Äertzl. Ztschr.*, 1883, 157.

182. Choleragefahr für München. *Prag. Med. Wchnschr.*, 1883, VIII, 289; 301.

183. On the probability of an invasion of cholera in Europe. *San. Rec.*, Lond., 1883, 4 n.s., V, 47–51.

184. Aetiologie des Abdominaltyphus. *Arch. f. öff. Gsndtspflg.*, Strassb., 1884, IX, 92.

185. Ueber Desinfection der ostindischen Post als Schutzmittel gegen Einschleppung der Cholera in Europa. *Arch. f. Hyg.*, München & Berl., 1884, II, 35.

186. Ueber Vergiftung mit Leuchtgas. Münch. *Sitzber. Münch. Akad.*, 1883, XIII, 247.

187. Ueber die Reinigung des Liebig-Denkmals in München (with Baeyer and Zimmermann). *Berl. Chem. Ges.*, 1884, XVII, 230.

188. Belehrung über das Wesen der Cholera und das Verhalten während der Cholerazeit. (With R. Koch and Skrzeczka.) 1884.

189. Die Entdeckung des Cholerapilzes. *Münch. Neueste Nachrichten*, 1884.

190. Die Choleragefahr für München. *Münch. Neueste Nachrichten*, 1884.

191. Die Cholera. *Nord. u. Süd.*, 1884; *Deutsche Bücherei*, 1884.

192. Cholera. *Lancet*, 1884, II, 769; 816; 861; 904; 992; 1042; 1086. *Pop. Science Monthly*, 1884–5, XXVI, 503; 621; 750; 1885, XXVII, 25.

193. El colera. *Rev. Soc. Espan. de Hyg.*, Madrid, 1884, II, 292.

194. Die Cholera in Indien. *Archiv d. Hyg.*, 1885, III, 129. *Aerzt. Int. Bl.*, Münch. 1885, XXII, 223.

195. Die Trinkwasser und die Choleraimmunität des Forts William in Calcutta. *Archiv f. Hyg.*, München & Berl., 1885, III, 147.

196. Trinkwasser und Typhus auf der Festung Marienburg im Jahr 1874. *Jabresb. d. Untersuch.-Stat. d. Hyg. Inst. d. k. Ludwig. Max. Univ.*, München, 1885, II–IV, 56–64.

197. Cholera. *Indian Med. Gaz.*, 1885, XX, 56.

198. Ueber die Wasserversorgung der Stadt Linz a. Donau. *Gesundheitsingenieur*, 1886, No. iii, iv.

199. Ueber das Verhältniss zwischen Bacteriologie und Epidemiologie. *Münch. Med. Wchnschr.*, 1886, No. iv.

200. Bemerkung (Zur Arbeit des Herrn. D. N. P. Simanowsky: Ueber die Gesundsheitsschädlichkeit hefetrüber Biere und über den Ablauf der künstlichen Verdauung bei Bierzusatz). *Archiv. f. Hyg.*, München & Berl., 1886, IV, 24.

201. Zum gegenwärtigen Stand der Cholera. *Archiv. f. Hyg.*, München & Berl., 1886, IV, 249; 397; 1886, V, 353; 1887, VI, 1; 129; 303; 373; 1887, VII, 1.

202. "Chemische Sonette" Als Manuscript gedruckt, München, 1886.

203. Ueber Gesundheitsschädlichkeit mehrerer hygienisch und technisch wichtiger Gase und Dämpfe. *Sitzber. Münch. Akad.*, 1887, XVII, 179.

204. Der hygienische Unterricht an Universitäten und technischen Hochschulen. Vortrag in der Eröffnungssitzung des VI. internat. Congresses für Hygiene und Demographie. September 1887 in Wien.

205. Der epidemiologische Theil des Berichtes über die Thätigkeit der zur Erforschung der Cholera im Jahre 1883 nach Aegypten und Indien entstandten deutschen Commission. München und Leipz., 1888.

206. Die Mittel zur schnellen und sicheren Entfernung alter, verhärteter und beschmutzer Oelfirnisse. *Techn. Mittheil. f. Malerei von A. Keim*, München, 1888, No. xl.

207. Ist das Ausströmen grosser Mengen Kohlensäure in Arbeitsräumen durch Defectwerden von Kohlensäure-Kühlmaschinen gefährlich? (With Emmerich), *Ztschr. f. d. gesamte Bauwesen*, 1888, No. vii.

208. Die Typhusbewegung in München von 1851 bis 1887. *Breslau. Äerztl. Ztschr.*, 1889, XI, 33. *Wien. Med. Bl.*, 1889, XII, 37; 51; 67; *Giorn. internaz. d. sc. med.*, Napoli, 1889, n.s., XI, 280.

209. Hofrath Dr. Max Jacubezky. Nekrolog. *Münch. Med. Wchnschr.*, 1889.

210. München eine gesunde Stadt. *Münch. Neueste Nachrichten*, 1889.

211. Rerum cognoscere causas. Ansprache des Präsidenten der k. b. Akademie der Wissenschaften in der öffentlichen Festsitzung am 15 Nov. 1890. München, 1890.

212. Ueber Wirkung der Gasbeleuchtung bei Chloroformnarkose. *Sitzber. Münch. Akad.*, 1890, XX, 1.

213. Die Verunreinigung der Isar durch das Schwemmsystem von München. München, 1890.

214. Zur Einführung des Schwemmsystems in München. *Münch. Neueste Nachrichten*, 1890.

215. Ueber Verunreinigung und Selbstreinigung der Flüsse. *Schilling's J. f. Gasbeleuchtung u. Wasserversorgung*, 1890.

216. Verunreinigung der Isar durch Abflüsse aus München und Verunreinigung des Isarflusses bei niedrigstem Wasserstande. *Münchner Gemeindezeitung*, Beil. 2 zu No. xcvii, 1890. *Deutsche Bauzeitung*, 1891, No. xiv.

217. Die Untersuchung der Isar auf Flussverunreinigung von München bis Ismaning und über die Selbstreinigung der Flüsse. *Deutsche Bauzeitung*, 1891, No. xix.

218. Selbstreinigung der Flüsse. *Deutsche Bauzeitung*, 1891, No. xxxv.

219. Ueber Selbstreinigung der Flüsse. Vortrag gehalten in der hygienischen Section der 64. Versammlung deutscher Naturforscher und Aerzte zu Halle. *Deutsch. Med. Wchnschr.*, 1891, No. xlvii.

220. Zur Schwemmkanalisation in München. München, 1891. *Münch. Med. Abhandl.*, No. xii.

221. Zur Selbstreinigung der Flüsse. *Archiv. f. Hyg.*, München & Berl., 1891, XII, 269.

222. Zum gegenwärtigen Stand der Schwemmfrage in München. *Münch. Med. Wchnschr.*, 1891, No. xlv.

223. Acht Thesen gegen die Münchner Schwemmkanalisation. München, 1892. *Münch Med. Abhandl.*, No. xxv.

224. Ueber Cholera mit Berücksichtigung der jüngsten Choleraepidemie in Hamburg. *Münch. Med. Wchnschr.*, 1892, XXXIX, 807; 826. *Münch. Med. Abhandl.*, No. xxxix. *Med. Centralbl.*, Wien, 1892, XXVII, 673; 685; 697; 713; *Wien Med. Bl.*, 1892, XV, 725. *Sitzber. Aerztl. Verein*, Münch. 1893, II, 107. *Lancet*, Lond., 1892, II, 1182.

225. Ueber die Cholera von 1892 in Hamburg und über Schutzmassregln. *Arch. f. Hyg.*, Münch. & Berl., 1893, XVIII.

226. Maasregeln gegen die Cholera hier, die sanitären Verhältnisse der Irrenanstalten, Siechenhäuser, Arbeitshäuser, Gefangen- und Strafanstalten; Gutachten des k. Obermedicinal-Ausschusses. *Münch. Med. Wchschr.*, 1894, XLI, 181.

227. Choleraexplosionen und Trinkwasser. *Münch. Med. Wchnschr.*, 1894, XLI. *Münch. Med. Abhandl.*, No. xlviii.

228. Canalisation von Ortschaften an Binnenseen. (With Bruno Hofer.) München, 1898.

OTHER PUBLICATIONS

229. Buchanan, G. On Prof. Pettenkofer's theory of the propagation of cholera. *Med. Times & Gaz.*, Lond., 1870, I, 283.

230. Buhl, Ludwig. Ein Beitrag zur Aetiologie des Typhus. *Ztschr. f. Biol.*, München, 1865, I, 1.

231. Cunningham, James M. Recent experience of cholera in India. *Lancet*, Lond., 1874, I, 477.

232. Cunningham, James M. Cholera: What Can the State Do to Prevent It? Calcutta, 1884.

233. Von Delbrück, E. Bericht über die Cholera-Epidemie des Jahres 1855 in der Strafanstalt zu Halle. Halle, 1856; *ibid.*, 1866.

234. Drasche, Anton. Die epidemische Cholera. Wien, 1860.

235. Emmerich, Rudolf. Pettenkofer. *Deutsche Revue*, Jan., 1902.

236. Emmerich, Rudolf. Max Pettenkofer's Bodenlehre der Cholera Indica. München, 1910. 748 pp.

237. Erismann, F. Pettenkofer. *Deutsch. Med. Wchnschr.*, 1901, No. xiv.

238. Farr, William. Report on the Mortality of Cholera in England in 1848–9. London, 1852. 300 pp.

239. Farr, William. Report on the Mortality of Cholera in England 1848–9. Critique. *Ztschr. f. Biol.*, München, 1865, I, 378.

240. Finkelnburg, Lent und Wolffberg. Festschrift des Niederrheinischen Vereins für öffentliche Gesundheitspflege und des Centralblattes für allgemeine Gesundheitspflege zur Feier des 50jähringen Doctorjubiläums Max von Pettenkofer's am 30. Juni 1893. Bonn, 1893. 177 pp.

241. Frank, Johan Peter. System einer volständigen medicinischen Polizey. Frankenthal, 1791–4.

242. Frank, M. Die Cholera-Epidemie in München in dem Jahre 1873–4, nach amtlichen Quellen dargestellt. München, 1875.

243. von Gietl, F. X. Geschichtliches über die Cholera-Epidemie in München in Jahre 1854. Zusatz zu der Schrift: Die Cholera nach Beobachtung u.s.w. München, 1855.

244. Grashey, H. Die Cholera-Epidemie im Juliusspittale zu Würzburg. Würzburg, 1867.

245. Griepenkerl, O. Die örtlichen Ursachen des Typhus und der Cholera in Königslutter (Braunschweig). *Ztschr. f. Biol.*, München, 1867, III, 370.

246. Gruber, Max. Pettenkofer. *Wien. klin. Wchnschr.*, 1901, No. v.

247. Gruber, Max. Max von Pettenkofer. *Ber. d. deutsch. chem. Gesellsch.*, 1903, XXXVI, 4512.

248. Gruber, Max. Pettenkofer. *Biographisches Jahrbuch und Deutsch. Nekrolog.*, 1904, VI, 3.

249. Guerin, Jules. Cholera. *Bull. Acad. de méd.*, Par., 1883, p. 931.

250. Hergt. Geschichte der beiden Cholera-Epidemien des südlichen Frankreichs u.s.w. Coblenz, 1838.

251. Hirsch, August. Handbook of Geographical and Historical Pathology. Trans. by C. Creighton for New Sydenham Soc., Lond., 1883.

252. Jameson, H. G. A Treatise on Epidemic Cholera. Phila., 1855. 286 pp.

253. Koplik, Henry. The Present Aspect of the Cholera Question (Prof. Max von Pettenkofer). *Lancet*, Lond., 1886, II, 28.

254. Köstlin, P. Die asiatische Cholera zu Stuttgart im Jahre 1854. *Med. Cor.-Bl. d. würzb. aerztl. Ver.*, Stuttg., 1855, XXV, 203.

255. Kruse. Für oder wider Pettenkofer? *Centralbl. f. allg. Gsndbtspflg.*, Bonn, 1906, XXV, 279.

256. Lehmann, K. B. Pettenkofer. *Müncb. Med. Wcbnscbr.*, 1901, No. xii.

257. Letheby. Propagation of Cholera. *Med. Press & Circ.*, Dublin, 1868, V, 55.

258. von Liebig, J. Ueber die Constitution des Harns der Menschen und der fleischfressenden Thiere. 1843.

259. von Liebig, J. Eine neue Fleischbrühe für Kranke, 1847.

260. Lumsden, L. L., and Anderson, J. F. The Origin and Prevalence of Typhoid Fever in the District of Columbia, 1909–10. *Hyg. Lab. Bull.*, Wash., 1911, No. lxxviii, Rep. No. 4.

261. MacNamara, C. Cholera in Calcutta. *Indian Med. Gaz.*, Calcutta, 1872, VII, 77; 99; 145; 1873, VIII, 33; 62; 1874, IX, 57.

262. Macpherson. Cholera and Its Home. London, 1866.

263. Martin, Aloys. (Edit).Hauptbericht über die Cholera-Epidemie des Jahres 1854 im Königreich Bayern. München, 1857.

264. Neufville, W. Ueber das Auftreten der asiatischen Cholera zu Frankfurt a/M im Jahre 1849. *Arcb. f. Pbysiol. Heilk.*, Stuttg., 1858, XV, 467.

265. Peskoff, P. A. Otsǐenka teorii Pettenkofera pomoshtshyŭ meditsinskoĭ statistike, otnositelno razvitiya Kholerî. *Trudî. Obsb. Vracb g. Kazani.*, 1872–3, V, Sect. 1, 287.

266. Quaglio, Julius. Max von Pettenkofer als Chemiker. Berl., 1900.

267. Seidel, Ludwig. Numerischer Zusammenhang zwischen der Häufigkeit der Typhuserkrankungen und dem Stande des Grundwassers in München. München, 1866.

268. Seidel, Ludwig. Vergleichung der Schwankungen der Regenmengen mit den Schwankungen in der Häufigkeit des Typhus in München. München, 1866.

269. Simon, John. Report on the Last Two Cholera Epidemics of London, as Affected by the Consumption of Impure Water. Lond., 1856.

270. Snow, John. The Cholera Near Golden Square and at Depfard *Med. Times & Gaz.*, Lond. 1854, n.s., IX, 321.

271. Snow, John. Cholera and the Water Supply in the South Districts of London in 1854. *J. Pub. Healtb*, Lond., 1856, II, 239.

272. Sutherland. Report of Epidemic Cholera in 1867 in the Punjab, Northwestern and Central Provinces of India. *Army Med. Dept. Rep.*, Lond., 1866, 380.

273. Vinnay, C. Le choléra et l'immunité de la ville de Lyon. *Lyon méd.*, 1883, XLIII, 469; 542; XLIV, 61.

274. Virchow, Rudolf. Canalisation oder Abfuhr? Eine hygienische Studie. Berlin, 1869.

275. von Voit, Carl. Max von Pettenkofer zum Gedächtniss., München, 1902.

276. Weyl, Th. Handbuch der Hygiene, Jena, 1896.

277. Bayrische Staatsregierung, 1836.

278. Ueber die Canalisation von Berlin. Gutachten der wissenschaftlichen Deputation für das Medicinalwesen u.s.w. Berlin, 1863.

279. Berichtigungen zu den Verhandlungen der Cholera-Conferenz in Weimar am 28 u. 29 April 1867. *Ztscbr. f. Biol.*, München, 1867, III, 323.

280. Auszug aus den Untersuchungen von Dr. Douglas Cunningham in Ost-Indien über die Verbreitungsart der Cholera. *Ztscbr. f. Biol.*, München, 1872, VIII, 251.

281. Dr. Douglas Cunningham's Untersuchungen über Pettenkofer's Theorie auf Madras augewendet. *Ztscbr. f. Biol.*, München, 1872, VIII, 267.

282. (Obituary of Pettenkofer). *Tr. Epidemiol. Soc. Lond.*, 1900–1, XX, 118.

283. (Biographic Note on Pettenkofer). *Sanitarian*, London, 1877, V, 367.

284. Dr. Max von Pettenkofer. *Pop. Science Montbly*, N. Y., 1883, XXIII, 891.

285. Pettenkofer on Virchow's Theories (Editorial). *Indian Med. Gaz.*, Calcutta, 1884, XIX, 263.

286. Das Pettenkofer'sche Experiment (Editorial). *Wien. med. Bl.*, 1892, XV, 813.

SIR DOMINIC CORRIGAN

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LONDON

ONE hundred years ago (1825) a young Irishman, named Dominic Corrigan, obtained the M.D. degree at the University of Edinburgh. Later in life he became one of the most distinguished physicians of his time, and all students today, who are trained in English medical schools, are familiar with his name, for they are taught to recognise the characters of the "Corrigan's pulse." Many years ago medical men spoke of "Corrigan's cirrhosis" of the lungs and, in France, the term "*maladie de Corrigan*" was often used for the disease which we now generally describe as aortic regurgitation.

Nevertheless most medical men, at the present time, know nothing about Corrigan, except that he was the physician who described the type of pulse with which his name is associated, and attributed it to aortic regurgitation.

Dominic John Corrigan was born in Dublin in 1802. His father, John Corrigan, lived at that time in Thomas Street, Dublin, and also owned a cottage, "The Lodge," at Kilmainham. John Corrigan was an intelligent and energetic man, and was engaged in farming and in the sale of agricultural implements. His wife was a lady of talent and beauty. John Corrigan was successful in business and was able to give his children excellent educations.[1] Young Dominic Corrigan was sent to the lay college at Maynooth, then one of the first Catholic educational institutions in Ireland. Here he soon distinguished himself in his studies, especially in physical science, and he frequently assisted the professor of natural philosophy.

Afterwards Corrigan was apprenticed, as was the custom in those times, to a medical man, Dr. O'Kelly, physician to Maynooth College, who being much impressed by his ability and industry advised his father to send him to the University of Edinburgh.

At Edinburgh young Corrigan completed his medical studies and in 1825 took the degree of M.D., the subject of his thesis being scrofula. Corrigan was only twenty-three years of age when he obtained his M.D. degree. Soon afterwards he settled in Dublin and there he continued to study, as well as to practice medicine. Having been highly educated at Maynooth Lay College in Latin, Greek, French and physical science, he was a diligent reader and he studied the best medical literature in English, French and Latin.

And now the usual period of waiting followed. In this period Corrigan was advised to try several objectionable methods of gaining success in his profession. But we have a note which will interest all who attach special importance to the reading of medical history. We are told that in this waiting period, the careful study of a little book entitled "Lives of Eminent British Physicians from Linacre to Gooch," and his own reflections, satisfied Corrigan as to what should be the true basis of a good reputation in medicine, and therefore he worked and waited.

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[1] In this article many statements will be found which differ much from those of a well-known physician who has written a brief, but critical biography of Corrigan. The details respecting Corrigan's early life, given in the present article, are based largely on a valuable sketch of his career by his distinguished pupil and old friend, the late Sir Francis Cruise; and these details may therefore be regarded as accurate. My opinions of Corrigan's work and of his character are based on a study of his writings; and being an Englishman and never having lived in Ireland, I may therefore perhaps claim that they are unbiased. The illustration (see frontispiece) is from a photograph of a portrait in the Royal College of Physicians, Dublin, and to that College I am indebted for permission to reproduce it. The photograph was kindly given to me by Dr. Kirkpatrick of Dublin.

In recommending this book to students later in life Corrigan said that it would show them, as it did him: "There is but one road to excellence and success in our profession, and that is by steady study and hard labour."

Early in life Corrigan obtained the post of physician to the Jervis Street Hospital in Dublin. On appointment, according to the custom of that institution, he was obliged to contribute a large sum of money to the hospital funds. But the number of beds at his disposal was only six. Nevertheless, by carefully choosing his cases and devoting great attention to them, with only these six beds he laid the foundation of his great reputation as a physician, pathologist and teacher. His two famous papers, which established his reputation, were written while he was physician to the Jervis Street Hospital.

He soon made rapid progress in his profession and became professor of medicine at the Digges Street school, then in the Peter Street school, and later in the Richmond Hospital (or Carmichael) school. We are told that he was a most able teacher, and that his lectures were so crowded with students that there was great difficulty in finding accommodation for them.

He was also visiting physician for some years to the Cork Street Hospital; and there obtained much experience in the diagnosis and treatment of fevers.

In 1832, at the age of thirty, Corrigan published his famous paper on aortic regurgitation in the *Edinburgh Medical and Surgical Journal*. The title of the paper was "On Permanent Patency of the Mouth of the Aorta, or Inadequacy of the Aortic Valves," and he tells us that so far as he is aware the disease had not been described "in any of the works on diseases of the heart." It must be admitted, however, that a few years previously (1829) Dr. Thomas Hodgkin had published a paper in the *London Medical Gazette*, "On Retroversion of the Valves of the Aorta." He described this condition of retroversion of the aortic valves as "that diseased state which allows of their dropping inwards towards the ventricle instead of effectually closing the vessel against reflux of blood." Hodgkin stated that his attention was first directed to the condition by Mr. C. Aston Key (apparently at the end of 1826) and he recorded cases which had come under his observation subsequently. The aortic valves were thickened and in some instances their edges were lacerated. The bruit was double, systolic as well as diastolic.

But any one who compares the two papers will see that it was Corrigan who clearly recognised that actual regurgitation of blood into the ventricle occurred in these cases of disease or inadequacy of the aortic valves. He emphasized this in his able article and described the double aortic murmur and recorded, in detail, the morbid appearances of the valves, giving three neat illustrations. Corrigan also described in this paper the character of the pulse which is associated with this disease, the excessive pulsation and the sudden expansion and sudden collapse of the arteries. He gave the explanation and pointed out that this character of the pulse was made more marked in the radial artery by raising the arm into the vertical position, and in the arteries of the leg by placing the patient in the recumbent position and raising the leg. His careful description of the pulse in aortic regurgitation fully justified medical men of his time, and afterwards, in employing the term "Corrigan's pulse."

Corrigan objected to the use of digitalis in these cases of aortic regurgitation and also to "depleting measures and a lowering plan of treatment." He recognised the advantage of the hypertrophy of the left ventricle which usually develops.

In this paper Corrigan laid the foundation of our knowledge of aortic regurgitation. It was a contribution to clinical medicine and pathology of the greatest importance, and through it he soon acquired a high reputation, as a physician of the first rank.

Trousseau has described the disease (aortic regurgitation) as "*maladie de Corrigan*" and even as late as 1890 this term was occasionally used in France. With respect to the name "*maladie de Corrigan*," the late Sir Francis Cruise relates the following story:

> Corrigan travelled a great deal, always visiting the hospitals in his tours. Once, when in Paris, going round the wards with the physician on duty, they came to a patient whose ailment was tabulated as the "*maladie de Corrigan*." The doctor, turning to his guest whose card he had received, asked him if he knew Corrigan of Dublin. "C'est moi, Monsieur," was the prompt reply. Enchanted to find who his guest was, the doctor led him to the lecture theatre and presented him to the class, and a right royal reception was given to the illustrious visitor.

In 1838 Corrigan published another article of great importance in medicine and pathology. This was his paper on cirrhosis of the lung, in which he pointed out the distinction between this condition (or fibroid lung) and tubercular phthisis with which it had been, up to that time, confused. This, of course, was long before the discovery of the tubercle bacillus; but he described clearly the clinical and coarse pathological differences between the two diseases. For many years the condition was often described as Corrigan's cirrhosis but now "fibroid disease of the lung" and other terms are used. Of the value of Corrigan's paper, the following opinion may be quoted from the book on fibroid disease of the lung by Sir Andrew Clarke, Dr. Hadley and Dr. Arnold Chaplin:[2]

> Corrigan's description has formed the text for all writers who have dealt with this part of the subject [disease commencing in the interlobular tissue]; and we are indebted to him for this remarkably clear statement, and for the recognition of the signs and symptoms which enable one to diagnose cirrhosis of the lung. It may be noted that in this account we first hear of the displacement of the heart and other organs as a result of the contracting process going on in the lung.

After the publication of these two papers Corrigan's reputation and practice increased greatly, and in 1840 he was elected physician to the Whitworth Medical and Hardwick Fever Hospitals. Now he had a satisfactory field for observation and teaching. We are told that he made good use of his opportunities, and that at eight o'clock every morning he was in his wards, examining his cases and teaching his students. For years he followed this practice, until other engagements made it no longer possible. He was followed by a large class of students, and both his clinical teaching and his systematic lectures were highly appreciated.

In 1853 Corrigan published his lectures on "The Nature and Treatment of Fever." In these lectures he recognised the difference between typhus and typhoid fever. This difference had been already clearly demonstrated by others, but it was not yet generally admitted.

One of Corrigan's early papers (on angina pectoris) is now of much interest. Recently attention has been directed to the cause of angina pectoris and to the view put forward by Sir Clifford Allbutt that the lesion is in the commencement of the aorta and its investing tissues. Soon after angina pectoris had been first described in England by William Heberden (Senior), an autopsy was obtained of a case in 1772: "Some few specks of a beginning ossification were found on the aorta"; in another case the aorta was ossified near the heart and the aortic valves were ossified (recorded by Dr. J. Wall). But little importance was attached to these changes, and later disease of the coronary arteries or pathological conditions of the cardiac muscle were regarded as the cause of the symptoms of angina pectoris.

For many years Sir Clifford Allbutt repeatedly urged the importance of aortitis, but at first without receiving much support.

In 1924, however, Prof. K. F. Wenckebach of Vienna in his able lecture at the Royal College of Physicians of London[3] supported Sir Clifford Allbutt's view. He considered that the clinical features of angina pectoris "are best explained on the theory of disease of the proximal aorta." Whether this view should eventually prove to be correct or not, it is interesting to note that Corrigan considered aortitis to be *one* of the causes of angina pectoris in an article entitled "On Aortitis, as One of the Causes of Angina Pectoris." In this article he attempted to show "that inflammation of the lining membrane of the mouth of the aorta is capable of producing the group of symptoms to which we give the name of angina pectoris." Pathological examination revealed acute aortitis in two of his cases and chronic aortitis in a third. Corrigan draws the following conclusion:

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[2] Lond., 1894.

[3] *Brit. M. J.*, Lond., May 10, 1924.

> That in some cases of what are called angina pectoris the paroxysms of dyspnoea, anxiety, mental distress, etc., constituting a fit of angina pectoris, and often supposed to be merely nervous, are really the symptoms of aortitis, or inflammation of the mouth of the aorta.

Of course, Corrigan's paper was not a careful consideration of the possible causes, or explanation of the symptoms of angina pectoris. It was merely a record of a few cases in which, pathologically, aortitis was found, and then a suggestion or conclusion that this was one of the causes of the affection. Nevertheless, his contribution is of interest at the present time. Sir Clifford Allbutt was evidently unaware of Corrigan's paper when he gave his celebrated lecture on angina pectoris in 1907. In his book on "Diseases of the Arteries Including Angina Pectoris,"[4] he tells us that he only became acquainted with Corrigan's paper six months after his lecture and he remarks that Corrigan is the only other modern physician, so far as he knows, who has distinctly attributed angina pectoris to disease of the aorta.

The Dublin Pathological Society was founded in 1836 and Corrigan, who was a keen pathologist, attended the meetings regularly, making frequent communications for many years.

In addition to his most important papers already mentioned he contributed many others to medical literature among which the following may be mentioned: "Bruit de soufflet et frémissement cataire"; "Bruit de cuir neuf"; "Opium in the Treatment of Acute Rheumatism"; "Functional Diseases of the Heart"; "Remedies in the Form of Vapors in Diseases of the Chest"; "The Treatment of Lumbago and Sciatica by the Actual Cautery" and articles on pemphigus, plica polonica, and rupia in the "Cyclopoedia of Practical Medicine."

Medical men who were students forty or fifty years ago will remember the small metal discs, known as "Corrigan's buttons," which were heated in the flame of a spirit lamp and then used for producing counter-irritation of the skin. (This was Corrigan's modification of the method introduced by Bretonneau.)

There have been many distinguished physicians whose interests in life have been almost entirely limited to clinical and pathological study. But Corrigan, like physicians of the best type, had a broader outlook. He was keenly interested in all that promoted the physical, mental and moral welfare of his countrymen.

In 1846 when the terrible famine occurred in Ireland, he acted with Sir Philip Crampton and Sir Robert Kane on the Central Board of Health for Ireland; and the country owed much to his great energy. After a hard day's work in his hospital and private practice, we are told, he often devoted six or eight hours to official work, receiving and answering communications from all parts of Ireland. In this heavy work he was much criticised in one respect; but he had the satisfaction of knowing he had tried to do his duty, and of learning that his work was highly appreciated by the Irish government.[5] The famine of 1846 was due to the failure of the potato crop in Ireland; and Corrigan published in that year his able pamphlet on famine and fever as cause and effect. In this pamphlet he pointed out that we find famine invariably preceding or accompanying epidemic fever (it matters not how other circumstances vary); and he gave a grave warning that there was a great risk of fever following the famine of 1846. He pointed out that the potato, which was the chief article of food in Ireland, had been the curse of the country. It had reduced the wages of the laborers to the smallest pittance, and when a bad potato crop occurred there was no descent for them in the scale of food. The next step was starvation. This pamphlet contained a strong appeal to check the famine, and then the prevention of fever might be expected. In spite of generous aid sent from Britain and America, fever[6] followed the famine as Corrigan had foretold, and from famine, fever and emigration the population of Ireland diminished enormously.

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[4] Allbutt, Sir C. Lond., 1915, II, 429.

[5] The dispute was chiefly due to the rate of pay to medical men attending fever patients, which was considered much too low; but we do not know now all the reasons for the low fees.

Corrigan had a large experience in the treatment of cholera during the epidemic of 1832, and in 1866 he published a cholera map of Ireland.

Another of Corrigan's writings deserves brief mention, his little book entitled "Ten Days in Athens, with Notes by the Way."[7] The notes by the way are observations on places visited in France, Italy and the Mediterranean, in the journey from Dublin to Athens. This is merely a little book of brief holiday notes, and as such it will interest those who enjoy foreign travel. But it will be of far greater interest to lovers of medical biography, because it enables us to understand what kind of man Corrigan was. His medical writings show us his mental abilities, and his powers of observation and deduction from facts; but this little book reveals to us something of the character of the man. One rule which Corrigan strictly adhered to, in writing these notes of travel, is especially deserving of attention at the present time. He mentions the numerous distinguished people whose acquaintance he made, during his holiday, in France, Italy and Greece—distinguished professors, doctors, military men and so forth; he mentions dinners, receptions and interviews (including one granted to him by the Queen of Greece); but he never records the conversation or remarks of any one. He tells us that he considers all such conversation should be regarded as private, and that therefore it should not be printed. How much annoyance and pain would be avoided, at the present time, if all writers followed Corrigan's rule.

In education generally, and in medical education especially, Corrigan took a keen interest. At the annual meeting of the British Medical Association in Dublin, in 1867, he gave the address in medicine. His subject was medical education, and he advocated a higher standard of general and professional education for medical men. At the commencement of this address he made the following impressive remarks:

> And among the bonds that unite the three divisions of this our Kingdom [England, Scotland and Ireland] together, there are none stronger than those of our Profession, soaring in its exercise above all sectarian discord. We know no difference of race, or creed, or colour, for every man is our neighbour; and when we remember that the Redeemer, while on earth, chose the healing of the sick as one of the most impressive evidences of his Divine Mission, we must ever hold in respect the exercise of a profession that devotes its efforts to the same object.

Corrigan took up a very definite position with regard to inquiries from insurance companies, respecting the health of people who were applying for life insurance. He held that a medical man, who had not made a special examination of a candidate for the life insurance company, should never answer questions put to him by the company respecting the health of that candidate, if he had been his patient, no matter whether the candidate had or had not given consent. His article on the subject appeared in the *Medical Press and Circular* for April 22, 1868.

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[6] In medical reports about this period the word "fever" was used rather indefinitely. It appears to have included both typhus and typhoid fever. The distinction between these two affections was then made by only a few medical men; usually the two diseases were confused.

[7] Lond., 1862.

In 1860 Corrigan was a strong advocate for a purer and better water supply for Dublin and had great influence in securing one. Late in life he published reminiscences of the dissecting room in his early days.[8] His anatomical studies had been pursued under difficulties and to procure subjects he had to have recourse, like his contemporaries, to measures which were very objectionable (body snatching). On one such expedition he encountered a widow weeping over the grave of her recently buried husband, who had died on his return as a harvester from England. We are informed that Corrigan not only relented, but originated a subscription for the widow.

For some reason Corrigan decided, in 1843, to go up for examination for the membership of the Royal College of Surgeons of England and we are told that, on presenting himself before the examiners, he was asked "Are you the author of the Essay on Patency of the Aortic Valves?" On replying in the affirmative, it is said he was allowed to pass without further questions.

He received many honors and distinctions. In 1849 he received an honorary degree of M.D. at the University of Dublin. In 1859 he was elected a Fellow of the Royal College of Physicians of Ireland. Soon afterwards he became president of that college and was elected to the post five times. Chiefly through his efforts a new college was built. In this new college may be seen his portrait and his statue. He was appointed consulting physician to the Maynooth Catholic College in 1831. He was elected vice-chancellor of the Queen's University, Ireland, in 1871 and for twenty-one years he was a member of the General Medical Council as its representative. In 1847 he was appointed Honorary Physician in ordinary to Queen Victoria in Ireland, a distinction never previously given to a Roman Catholic; and in 1866 he was created a baronet.

Later he devoted his attention, for a time, to parliamentary work. He entered Parliament as a member for Dublin in 1870. But we are told that he was not a success in his parliamentary work, and that his friends regretted that he ever engaged in it. At the election, in 1874, he was not returned as a member, owing, it is said, to his loyalty to the temperance cause and the Sunday closing movement.

Corrigan lived at a period when Dublin was especially famous for its able medical men. This was the time of Graves, Stokes, Banks and many others whose names occupy a high position in the history of medicine. But, as Sir Francis Cruise tells us: "Corrigan was second to none." His consulting practice became very large, and for many years his income was one of the largest on record among Irish physicians. His countrymen were proud of him as an Irishman and a Catholic. His great fame as a consulting physician was largely due to his good sense and practical experience, in addition to his able writings; and we are told that he owed all his success in life to his own exertions. He was a man of great physical energy and "had been an athlete in his way and a splendid horseman and rider to hounds." He was kind and cheerful and full of the quiet humor typical of Irishmen.

Sir Francis Cruise relates the following story of Corrigan:

> Once, when attending a lady of rank in fever, when he entered her room, accompanied by her anxious husband, he said to the latter: "She is better." The visit completed, when they left the patient, the husband asked him how he knew at a glance and without examination that the patient was better. "I knew it," said Sir Dominic, "by an infallible symptom—I saw the handle of a looking-glass peeping from under her pillow!" He was right. The lady was better and made an excellent recovery.

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[8] *Brit. M. J.*, Jan. 11, 1879, p. 59.

Corrigan was greatly interested in natural history and was president of the Royal Zoological Society of Dublin. He was a frequent visitor to the Zoological Gardens in Phoenix Park where on one occasion a serious accident occurred. Sir Frances Cruise relates:

> A visitor approaching too near the wolf's cage had his hand seized by the savage brute, who held it tightly . . . Despite the efforts of a policeman standing near, who belaboured the wolf's head with his baton, the enraged animal held his grasp—the blood flowed copiously, and the surrounding crowd was terror-stricken.
>
> Corrigan, . . . seizing the policeman's baton, . . . forced the handle, the narrow end between the wolf's jaws, and with a sudden twist brought the point against the roof of its mouth. The wolf, in agony, let go the hand and fled to a corner of the cage howling.

Corrigan was a Roman Catholic, and we are told that his progress was checked, at first, by his religious faith. In his early days Catholics suffered from many disabilities. No Catholic was permitted to sit in parliament, or hold civil or political offices. But in 1829 the Catholic Emancipation Act was passed, and Catholics were allowed the same political rights as Protestants. Corrigan overcame the difficulties he had to face owing to his religious views and he remained a loyal and sincere Catholic up to the end of his life. But he was broadminded and advocated absolute religious equality in Ireland.

Freedom of thought in religion should mean, as it does in science, the freedom to believe something and the freedom to believe much, as well as the freedom to believe nothing or little. But usually those who have strongly advocated freedom of thought have meant only the freedom to believe nothing or little. Corrigan, however, advocated the freedom to believe something and the freedom to believe much—that freedom which, in modern times, so many have endeavored to restrict, indirectly if not directly. His attitude was clearly shown by his famous speech at a meeting to take measures for the completion of the new church of Sts. Augustine and John, which was being erected on the site of his birthplace in Thomas Street, Dublin.[9]

Now medical biography has no concern with the disputes between Catholics and Protestants; but Corrigan's speech is worthy of mention because it reveals important traits in his character: his fairness, tolerance and humanity. He sketches three phases in the struggle which Catholics have had during the last 150 years. First there was the period when penal laws existed. Then came the second phase, the struggle for civil rights ending in the success of O'Connell and the passing of the Catholic Emancipation Act. Corrigan pointed out that O'Connell did not win his victory by bloodshed or violence; it was won without the loss of one drop of blood or one infliction of human suffering; and Corrigan told his hearers that he wished O'Connell's teaching at this time had never been forgotten. In the third phase of the struggle was the demand for religious equality, which Corrigan so strongly advocated. To all readers of this speech at the present time, the thought must occur, how different might have been the history of Ireland during the last terrible twenty years, if all leaders of the Irish people had strictly followed Corrigan's advice, to avoid bloodshed and violence, and carefully impressed it on their fellow-countrymen!

Like all men, of course, Sir Dominic had failings. But after the lapse of so many years our records of them appear very unreliable and indefinite. Probably they were mostly trivial, and it would be unnecessary to dwell on them, even if we had reliable records, since they would interest only those who delight in gossip.

In his later years, Corrigan suffered from gout; a statement which may remind some readers of medical biography of the saying of Sydenham: "Gout rarely attacks fools." At the end of his life this ailment impaired his activity, and in 1878 he suffered from a slight paralytic attack. On December 30, 1879, he became paralyzed on the left side. A month later, February 1, 1880, he died, deeply regretted by the people of Ireland and generally regarded as "a man of stainless character, great genius and kindly heart."[10]

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[9] This speech is recorded in *Freeman's J.*, May 24, 1869.

Corrigan was one of the most famous (if not *the* most famous) of the Irish physicians of the past: a man of great mental ability, energy and courage, and a sincere Christian. His eloquent speeches have been long since forgotten; but the words of one sentence in his address to medical men (already mentioned) deserve to be ever remembered: "We know no difference of race, or creed, or colour, for every man is our neighbour."

Bibliography

Brit. M. J., Lond., 1867, ii.

Corrigan, D. J. On permanent patency of the mouth of the aorta or inadequacy of the aortic valves. *Edinb. M. & S. J.*, Apr. 1, 1832.

On aortitis as one of the causes of angina pectoris. *Dublin J. M. Sc.*, 1837, xii, No. 25.

On cirrhosis of the lung. *Ibid.*, 1838, xiii, 266.

Lectures on the Nature and Treatment of Fever. Dublin, 1853.

Cruise, Sir F. R., Hon. physician in ordinary to His Majesty King George v in Ireland. Article on Sir Dominic Corrigan. In Twelve Catholic Men of Science, ed. by Sir Bertram Windle, m.d., d.sc., f.r.s., Lond., 1912.

Hodgkin, T. On retroversion of the valves of the aorta. Read before the Hunterian Soc., Feb. 21, 1827; Second communication, Feb. 18, 1829. *Lond. M. Gaz.*, Mar. 7, 1829.

Obituaries. *Brit. M. J.*, Lond., 1880, i, 227, 266.

Dublin J. M. Sc., Mar., 1880.

Freeman's J., Feb. 2, 1880.

Lancet, Lond., 1880, i, 268.

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[10] Obituary. *Freeman's J.*, Feb. 2, 1880.

THE LIFE AND WORKS OF GILLES DE CORBEIL

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No field is more fascinating in medical academic history than the study of the relationships between the various centers of medical learning in the Middle Ages. One followed the other in carrying the torch, in dispensing long-inherited lore; and they flourished according to the spirit which dominated the age. When Salerno began to decline, Montpellier already flourished and Paris rose to leadership. The history of Paris is full of deep interest; the timid beginnings of the great school at Monte Sainte Geneviève, under the archways of Nôtre-Dame, and the secluded but resounding halls of Saint Victor were to mark the growth of the famous Studium when Salerno was going slowly down.

The medical learning cultivated at Salerno had a very direct influence upon the new school, a very direct human influence in the person of Gilles de Corbeil. It was this scholar of Salerno who became the dominating medical personality in Paris at the end of the twelfth and the beginning of the thirteenth century. Turning to him, ample occasion will be given to illustrate the Salernitan origins of some phases of Parisian learning. I shall undertake to sketch the life and the works of Gilles de Corbeil,[1] or Aegidius Corboliensis, archiater, physician-in-ordinary to King Philip Augustus (1180–1223).[2]

The external facts of his life are rather little known. He was born in the small town of Corbeil, in the Île de France, about twenty-five miles southeast from Paris. This place was the seat of a noble clan, the Counts of Corbeil.[3] The date of his birth is unknown, though it can be placed in the middle of the twelfth century. The outstanding event in his earlier life and that which determines his interest for us is that he pursued medical studies in Salerno,[4] the medical school of which must have reached the acme of its reputation during his youth.[5] His master there, among others, was Romoald,[3] court physician to Pope Clement III. To this master, whose influence over him was lasting, Gilles dedicates one of his works, the "De laudibus et virtutibus compositorum medicaminum."[6] He mentions some other men, too, as his teachers. We hear of Musandinus,[7] also known as Petrus de Musanda, author of the booklet "Summula de preparatione ciborum et potuum infirmorum secundum Musandinum,"[8] a little work indicating the special direction of Salerno, which was toward prevention and dietetics. That master is eulogized by his grateful pupil again and again.[9] There are other men besides Musandinus who are discernible as Gilles' teachers, Maurus[10] and Urso (Orso[11]). Of the influence of the early Salernitans, as Gariopontus, Petroncellus, Trotula (?), Johannes Afflatius and Alphanus upon this belated disciple of the sinking school we cannot say anything. Their names are not mentioned. On the other hand we hear of a Platearius; to which member of the family this refers, however, we can but guess. It is probably Matthaeus, whose "Circa instans" (preserved together with the famous "Antidotarium Nicolai")[12] formed the standard collection of pharmaceutical material existing throughout the next centuries. That the materia medica of Aegidius was created both formally and contextually under the influence of this Platearius can be discerned in these lines of the "De laudibus":

> Vellem quod Medicae doctor Platearius artis
> Munere divino vitales carperet auras:
> Gauderet metricis pedibus sua scripta ligari,
> Et numeris parere meis . . . vv. 110–113.

Of his fellow-students we know of a certain John (Johannes Castalius), another pupil of Musandino; this is none else but the Cardinal Johannes de Sancto Paulo, himself an author of a medical work,[13] the very Salernitan "Breviarium" and Papal legate in later years to France.[14]

Those years of study in Salerno must have been numerous and their *terminus ante quem* is the year of Romoald's death (in 1181).[15] His more mature works, like the "De laudibus et virtutibus," were written when he was no longer in Salerno. Gilles did not have to witness the sack and destruction of that city[16] by the Emperor Henry VI (in 1193) which event he never ceases to lament. Notwithstanding, the years of his stay in Salerno gave him plenty of opportunity to absorb that Constantino-Salernitan Galenism which characterizes his works, reflects his "early Arab" learning and which will be very evident to us after having discussed those works. Gilles' enthusiasm for his old school is boundless and persisting;[17] however occasionally we also hear criticisms which, incidentally, throw an interesting light upon some features of contemporary medical education. He complains about the youth of the students of medicine aspiring to mastership and particularly mentions Salerno in this connection:

> What a deviation from the ancient custom and from good judgment if I may say so are the present regulations in Salerno which tolerate with aequanimity that immature growing plants of physicians, undeveloped children should obtain Hippocratic rights and endorse and construct Machaonian laws! Far better way to learn would be for them to be spanked; it would be better for them to hang on the old teacher's lips than to ask for the honors of a chair of which they are not worthy.[18]

This statement started a controversy whether the criticism applies to Salerno only or to a more general condition, prevailing also in Paris.[19] Of course, at the time when the "De laudibus et virtutibus," the poem containing the incriminated statement, was written (around the year 1195), there were no regulations concerning the ages of the licentiates in Paris in operation. The Studium, as we know, was not yet formed and organized,[20] the University was *in statu nascendi.*

Outside of the considerable number of direct references, we find a quantity of indirect indications demonstrating the Salernitan origin of Aegidius' knowledge. The whole construction of his work, both in its form and in its contents, bears the Salernitan stamp so strongly that this in itself would make his person and work worth studying. The slender and mostly intangible threads connecting the Gulf of Amalfi with the banks of the Seine assume in his personality a human and vividly real existence.

After leaving Salerno, our Magister taught for a while in Montpellier and had there most disagreeable experiences.[21] Montpellier was at that time becoming the stronghold of the late Arabs; the learning there was more dogmatic and there was much opposition to the supposedly rather empirical teaching of Salerno. It is not easy to perceive very much difference between the two schools, although Salerno was under "early Arab" influence which made for freer observation and less aprioristic thinking. Gilles, with his enthusiasm for Salerno, was bodily driven out of the city; his career in the South was ended.[22] Thence, after passing the both geographically and intellectually intermediate stage of Montpellier, he went to Paris, where we see him becoming canon of the Cathedral[23] and *archiater* to the King.

The royal physicians, usually called *medici regis* or *physici principis,* were influential dignitaries.[24] They could always approach the King's person, enter his apartments day and night, without permission. It is not wonderful then that during this close contact they acquired much influence with their royal masters which procured them impunity and rendered it possible for them to voice their opinions freely, if they had any to voice. That Gilles took ample advantage of this situation and indeed that some forms of his activity cannot be explained otherwise, but by being carried out under the royal shield, we shall presently see.

The designation "*archiater*," by which Gilles and many of his colleagues are known, appears first in Gregory of Tours who applies it to Reoval,[25] physician to Sigebert and to Marileif,[26] the *primus medicorum*, physician to Chilperic I. In Capetian times Obison is on record[27] as having been physician to Louis VI. It may be added that other sovereigns, too, had their *archiatres*.[28] Guilleaume de Jumièges mentions one John of Chartres[29] attached to the person of Henry I of England. In fact, some kings commanded both personal physicians and surgeons-in-ordinary,[30] the former always clerics, the latter laymen. The only exception to the clerical status was to be found in the Jews, some of whom were very prominent physicians through all periods of the Middle Ages, as is well known; one of them, Sedecius,[31] is heard of as *medicus* to Charles the Bald. The clerical *medici* all belonged to the secular clergy; the regulars were prohibited from practicing medicine by the Councils of Reims (1131),[32] the Lateran (second Council)[33] and Tours (1163)[34] which were supported by the authority of Hugo of St. Victor.[35]

Although it would seem that, according to these regulations, it could not have been possible for Gilles to practice medicine had he been a monk, nevertheless this remains a controversial question.[36] In many of the early editions he appears as Aegidius Monachus,[37] sometimes Delphensis, at other times "natione Graeci," confused with Gilles of Athens, an eighth century Benedictine, and with Joannes de Sancto Aegidio, a late Dominican. The confusion with the Greek Benedictine is probably due to an ambiguous passage in "De laudibus."[38] The two positions of royal archiater and Benedictine monk seem to be incompatible; there is strong evidence that he was closely connected with the King and also that he practiced the art of medicine;[39] it appears reasonable therefore to drop the designation "Monachus."

When Gilles commenced his activities as a teacher of medicine in Paris, the art as a systematized science was new in that city.[40] The great collection of disconnected norms and rules which Gilles' Salernitan learning represented was consolidated into that great body of learning which issued from the Patristic tradition and developed in the medical scholasticism of the thirteenth century fully. But Gilles found things *in statu nascendi*, as we have said, and had ample opportunity to participate in the growth of them, in the very city which, of all others, was most destined to become the center of all science and learning.[41] He must have flourished in Paris before the year 1198, as it was in that year that Gilles de Paris, his poet-namesake, finished his Carolinian epic which contains an eulogy of the Magister.[42] However, a passage in "De signis et sinthomatibus egritudinum" in which reference is made to the Horatian "Dens Theoninus,"[43] the false friend's slandering tongue, shows that, besides such enthusiastic friends as the poet, he must also have had enemies in Paris. In "De laudibus" one Zoile is being referred to:[44] with this person the author wishes to get even. But what the controversy between them was and who this Zoile might have been, we do not know. There is another rancour in the Magister's heart, however, the object and also the reason of which we know fairly well. His bitter hatred against the prelate so important in the history of the University of Paris, Cardinal Guala di Bichiero[45] is often emphasized. The reason for the invectives hurled against the Cardinal is most likely to be sought in the enmity between that Prince of the Church and Gilles' royal master,[46] together with the general resentment of the Parisian scholars incited by the Cardinal's drastic rules imposed upon them.[47] Aegidius was a great patriot[48] and an ardent devotee of the rising Paris[49] and the Papal Legate's actions could very well have excited his feelings.

Master Gilles seemingly was one of those who are at home in the "gentle art of making enemies." He must have had many in the ranks of the regular clergy who as a whole are fiercely denounced in the great satiric poem "Ierapigra ad purgandos prelatos."[50] Incidentally, this is another form of evidence for the contention that he could not have been a religious himself.

This interesting poem was known to contemporaries, as is witness Guilleaume le Breton who mentions it in his Philippides,[51] although it was lost later and even the meaning of its title, which is rather plain,[52] was not understood. It is directed against the clergy and especially against the regular clergy in a very violent way, denouncing the simony, cupidity, avarice and various other abuses observable amongst ecclesiastics; he pillories the debauchery and irregular life in some monasteries, reminding one of the first assailant of monasticism in satire, Rutilius Claudius Namatianus: "Squalet lucifugis insula plena viris."[53] There was always much attack on that system by saintly people, like Raoul de Tortaire[54] and Vincent of Beauvais,[55] the former a century before Aegidius, and unsaintly young people, witness the collection of Walter Map.[55a] Thus there was nothing original in Gilles' satire, except perhaps that his is one of the most venomous attacks ever launched against churchmen.[56]

It is probable that the King, whose Gallican spirit always rejoiced in fearless minds, protected his favorite courtier and physician, and looked upon these attacks with a certain glee. Gilles well understood the courtier's arts, he knew how to sway his master toward his own ends and he probably deftly used his confidential position to promote his personal advancement.[57]

Outside of the material that can be gleaned from his own writings concerning his life and character, and occasional, rare references like that of Gilles de Paris, medieval records omit to pay attention to his person. In fact, as we have seen, he was constantly confused by scribes, early commentators, editors and printers with other homonymics, which shows that he was very little known until modern times. The medieval attitude toward personal importance and the preservation of names was different from that of later periods. The works alone counted. They embodied all that a man was worth and the world was not concerned with his personal immortality. The author merged into his writings, the precise origin of which was of but little importance. An individual's work was part of the work of others; the whole body of knowledge was a large stream to which each contributed his share. In the massive flow of this stream the provenience of the individual waves is no more discernible. Later posterity, which happens to be interested in personalities, is placed at a disadvantage through this attitude of our ancestors.

Our Magister probably did not survive his patron Philip Augustus and the date of his death must be set down in the early twenties of the thirteenth century.

Aegidius was a learned physician, grown up under the shadows of the Cassino monk and brought up on sound medical tradition. He was wandering much and spreading joyously his learning. His teaching was greatly enhanced by the facility and pleasingness of his poetical vein. The content of that teaching we shall discuss presently. Here we must rest content with knowing that all his knowledge was derived from the Salernitan *civitas Hippocratica* and in his person we find most or all of the learning that Paris owes Salerno.

Personally he was a vain and ambitious man. He admonishes his students often to read his work rather than the lascivious "Ars amatoria" of Ovid. (It seems that Naso must have been a popular poet with the twelfth century student—nothing unusual!) But in all respects we can discern in him the child of his age, with all the characteristic naïveté, enthusiasm and eagerness. He is a good Christian; despises the Albigensian heresy;[58] is moral and has a high conception of his profession, advocating the unselfish help of the poor; this he considers the real joy in medicine. Although ambitious, he has enough of Christian humility to know that nothing is good that is done without the aid of others, that no work can be born in singleness:

> Nemo sua propria nitens virtute decenter
> Complet opus, cuius magno sub pondere posset
> Multorum quamvis perfecta fatiscere virtus.[59]

His work truly is the expression of a tradition and a school and therein lies its importance.

I shall now sketch his medical writings.[60]

At the opening of the thirteenth century, we have in Paris a complete edifice of classical learning, slowly growing in the sign of rationalism, clothed in the scholastic garb. To this is added the great labor of the early Arabs, introduced by Gilles, and possibly other vehicles too. The interchange of men and ideas was vigorous at this time: Robert of Sicily, duke of Normandy, Salerno's Maecenas, brought some material with him (the introduction of the famous "Regimen Sanitatis" is attributed to him); Adelard of Bath was probably also instrumental in bringing some of the Arab works to Paris.[61] However, we know that all the Arab books used at this period were parts of the Constantinian Corpus[62] and we equally know that this "Corpus" was part and parcel of Salerno's teaching which finds its expression in the *oeuvre* of Gilles. Gilles, on the other hand, entered Paris in the early eighties of the twelfth century, as we have seen, and it is therefore superfluous to assume any other channel, in regard to Salernitan transmission.

The works of Gilles de Corbeil were all clad in poetic form. That form was the Leonine verse; pure hexameters interspersed with distichs. The style of verse was prevalent in the academic circles of the twelfth century,[63] but in scientific literature more than anywhere it was applied in Salerno. Archbishop Alphanus,[64] one of the earliest teachers in the school, made use of it and how well it was developed in later centuries we can easily see from the "Regimen." The form of verse, however faulty it was prosodically, was indeed well adapted to popularize and distribute scientific writings in wide circles.

The following is the list of Gilles' medical works: "De Pulsibus"; "De Urinis"; "De laudibus et virtutibus compositorum medicaminum" and "De signis et sinthomatibus egritudinum." It is possible that some minor writings can be added to these.

These didactic poems were well known throughout the Middle Ages and some of them enjoyed extreme popularity. The two books "De Pulsibus" and "De Urinis" particularly were used as textbooks, which is indicated by their wide distribution in time and space.[65] They reappear as "Versus Egidii" again and again; the students in the University of Paris used them.[66] The "De Urinis" is more or less a restatement of Theophilis (Protospatharius)[67] who was the standard uroscopic author. It is a link in the uroscopic chain visible from Theophilus to Michael de Savonarola.[68] "De Urinis" (together with "De Pulsibus") is usually associated in early thirteenth century manuscripts with the following writings: Constantine's "Viaticum" (Abu-Jafar-Ahmed's Zad-el-Mouçaffir),[69] (the "Libri Isaac" (in Constantinian rendering: "Libri febrium, dietarum et urinarum"), the "Antidotarium Nicolai" and some Galenic treatises. Greek works constantly associated with Gilles are the "Aphorisms" of Hippocrates, Philaretes' "De Pulsibus" and, naturally, Theophilus' "De Urinis"; Arabian works are the famous "Isagoge" of Johannitius (Hunein-ibn-Ishâq), the "Ad Almansorem" of Rhazes and the "Pantegni."[70] In later (fifteenth century) manuscripts Gilles is always found in the company of his numerous commentators who arose after the fourteenth century. The more important ones are Gilbertus Anglicus, Gentilis da Fulgineo (Gentile da Foligno),[71] Gualterius de Agilo,[72] and in the late Quattrocento Avenantius de Camerino.[73] The associations of the Aegidian manuscripts are becoming more and more typical of the full medical scholasticism and late Arabism[74]: Avicenna, John of St. Amand, Bernard of Gordon, Petrus de Tussignano's comments to the "Ad Almansorem" and so forth.[75] In one manuscript we find him associated with the Salernitan Alphanus.[76]

It is clear from all this that the two books, "De Urinis" and "De Pulsibus" rose to prominence together with the classical and early Arab authors (which, in the main, the world owes to the African) and that they maintained their popularity throughout three centuries during the sway of the Neo-Arab doctrinarism. What we call Salernitan learning is after all chiefly Constantinian Arabism; Gilles' books, both in regard to their contents and to their subsequent fate depended entirely on the contents and fate of the Constantinian collection.[77]

The other works seem to have been far less popular, although their importance is much higher. The "De laudibus et virtutibus compositorum medicaminum," closely connected with the Salernitan stock of materia medica to which the "Antidotarium Nicolai" (Praepositi) and the "Circa instans" of Platearius belong and which superseded it completely, is extant in only one manuscript.[78]

The "De signis et sinthomatibus egritudinum" had been considered lost for a long period, since its description by Von Murr.[79] One part of it had been found and described by Daremberg in 1853,[80] the whole luckily discovered by Rose in the Amplonian collection (Erfurt) and published in 1907.[81] The "De Physiognomiis" was originally intended to be a part of this.[82] Outside of these medical works, we know the satirical poem "Ierapigra," referred to in the previous section,[83] with which the list of extant Aegidian books is exhausted.

Let us say a few words concerning the printed editions. The "De Urinis" has been first printed by Cerdone de Windischgraetz in Padua, 1483.[84] In printed form it retained its tremendous popularity and reached eight editions, besides being republished in Lyons and Venice.[85] This popularity was shared by the pulse treatise.[86] The four others, however, were not printed until the eighteenth and nineteenth centuries, the treatise on materia medica ("De laudibus, etc.") being first published by Polycarpe Leyser,[87] the diagnostic works ("De signis" and the "Physiognomics") by Daremberg and Rose, as we have seen.[88] The "Ierapigra" was discovered only in 1837.[89]

Gilles' place in the texture of learning can be determined much better by considering the later treatises (the "Ierapigra" of course excepted) than by a discussion of the earliest two works, which are generally acknowledged to be but Theophilus and Philaretes, respectively, in metric form.

The origins of the "De laudibus" are to be found in the Salernitan "Antidotarium."[90] That "Antidotarium," as has been recently shown,[91] is very probably nothing but the post-Constantinian form of the great collection of pharmaceutical norms that prevailed in the early Middle Ages, which existed in Salerno and were later strongly colored by Arab influence. These norms are to some extent preserved in some early medieval antidotaries: the London,[92] Bamberg,[93] Glasgow,[94] Reichenau,[95] St. Gall[96] and Berlin[97] collections,[98] together with the codex of Breslau.[99] In a slow process, through long and devious routes of Hebrew[100] and Jewish-Arabic translations, these norms, ultimately derived from the Hippocratic Corpus, Dioscorides, Scribonius Largus and Apuleius,[101] accumulated in the south of Italy; there they underwent thorough systematization. This was the work of several generations of medical men, from Gariopontus,[102] the author of a "Passionarius," in the early eleventh to the Platearius family in the twelfth[103] century and Nicholaus Praepositus[104] who flourished when the twelfth century turned into the thirteenth. There is no mention in Gilles' book of this Nicolaus and it would be correct to say that both authors had their roots in that large and indefinite collection of prescriptions which issued from the classics and the late Romans and found its way to Salerno to be enlarged upon by Salernitan masters. It is not possible to say how much of popular medical lore, of purely Western provenience, enters the "De laudibus," or whether there is any connection between it and the legendary "Macer Floridus,"[105] a Western pharmaceutic collection, or the numerous "Bestiaries" carrying much therapeutic advice. But it is certain, on the other hand, that the post-Constantinian Salernitan sources and not the early ones mentioned above were utilized. For there is in it much Arab lore, such as we find in Abu-Jafar-Ahmed's "Zad-el-Mouçaffir"[96]; the various syrups are an Arab specialty,[107] similarly Sandalum, Kebuli, Zedoar and other material that was unknown to the West before Constantine's work. The "Pantegni"[108] (another part of the Constantinian corpus) contains many of the prescriptions that we encounter in both "De laudibus" and the "Antidotarium."

Nearly all of the prescription material in Gilles can be discovered in one of the Pre-Salernitan collections mentioned above, in the "Zad-el-Mouçaffir," the "Pantegni" or in Nicholaus. We have before us the pure Salernitan pharmacopea, in a pleasing poetic form. The great number of *emplastra, electuaria*, the *Diacalamentum, Diaprassium, Unguentum Agrippa, emplastrum apostolicum*, and so forth are present in all these works; even the aphrodisiac *electuarium diasatyrion*[109] is contained in some of the early collections.

Thus, this long poem[110] conveys to us the pharmaceutic lore which is Salerno's pride. It was through Gilles and through the "Antidotarium" that Paris got acquainted with that lore and it is very possible that the priority belongs to Gilles, as the "Antidotarium" was not known to him.[111] Furthermore, the work of Nicolaus is not heard of in Paris for another century.[112]

The "De signis et sinthomatibus egritudinum"[113] is based on Galenic pathology. It will be enough to demonstrate in a few examples Gilles' dependence on Galen and the early followers of Galenism. The symptomatology of the so-called *emitriteus*[114] and the pathogenesis of *sincope*[115] are clear examples of this connection. Still more interesting and illuminating, because it gives an insight into the intricate development of astrological ideas, is Gilles' account of the causes of epilepsy.[116] Epilepsy, owing to its mysterious character, often caused scientific men to resort to fanciful and far-fetched explanations[117] and it is not wonderful that it became a fruitful playground for astrology. The *sacra passio* is due immediately to humors which overflow the brain.[118] But these humors are regulated in definite ways by the changes of the moon. Thus was it also conceived by Gilles' contemporary, Johannes de Sancto Paulo.[119] From where did these two disciples of Salerno derive this idea? It is first of all present in the "Pantegni."[120] The sources of that book, however, which professes to be an exposition of Galen, are not quite clear. Galen concedes the rôle of the humors and moisture in the production of epilepsy[121] and there is no doubt that in this he is the preceptor of Gilles. Ali-ibn-el-Abbas, the author of the "Pantegni," must have stood under the influence of Johannitius, or Hunein-ben-Ishâq, whose translation of the pseudo-Galenic commentary to the "Hebdomadai" of Hippocrates is crowded with astrological lore.[122] That author was highly influential throughout the Middle Ages, his "Isagoge ad Tegni Galeni"[123] was partly responsible for Galen's continued prevalence. There is, however, a statement in Galen which could have served well as the starting point for astrological speculation in regard to epilepsy,[124] and this, together with the fact that this speculation was never submerged and reappeared time and again in the Hermetic writings of medieval Greek astrologers,[125] upon whom various Arabs constantly relied, explains the origin of Gilles' astrological notions quite satisfactorily. Contrast the Galenic origin of this vague astrology with the Hippocratic origin[126] of the empirical prognosis of the disease.[127] Nevertheless, Gilles' statements are probably derived not immediately from Hippocrates, but through the medium of Galen.[128]

The quatrihumoral theory of Galen is used on every occasion.[129] The action of abundance of one of the humors, of *flegma insipidum* or of *salsum*, is both the cause of some diseases and serves as a basis for diagnosis; the color of the urine,[130] the character of breathing (stertorous respiration is described for instance) and the quality of the pulse are all indications of imperfect "digestion" and prevalence of some humors, as is also pallor of the face, tympanites or soporousness. Very often the expressions themselves are literally those of Galen.[131] But this solid Galenic foundation by no means excludes either powers or results of acute observation, as exemplified in the description of the apoplectic shock:

All the motive powers destroyed and only supplanted
By the motion of lungs, inspiring the air which will help the
Heart to perform its task . . .
Senses abandon their work and the tongue, mind's witness, is silent,
Never revealing the secrets of soul which now hide in seclusion,
The eye sees nought any more, the form nor colors of all things,
Nor does the ear give hearing to voices floating around it . . .
No perception is left of the sweetness of odors of flowers . . . [132]

One of the most interesting descriptions is the one concerning the *Signa febris pestilentialis*, the portion of the "De Signis" unpublished by Rose. We find a rather good symptomatology there: great thirst, pain in the mouth, dry tongue, "*splen tumidus*,"[133] *carnis tepor* (*défense musculaire?*) and dyspnea with polypnea.[134] Much of the influence of Aretaeus the Cappadocian[135] and of Rhazes[136] is recognizable here. It is here that the famous expression *atra mors* occurs perhaps for the first time in its long history:

Quam subito solet atra sequi mors significabunt
Pestiferam, quisquis legis, hec sinthomata febrem.[137]

A very great number of infectious diseases are described, among which we can easily recognize malaria (tertian and quartan type) and various gastrointestinal infections. I take one, to demonstrate the close connection of Salernitan learning with that of the late classics; the so-called *causo* which is probably a form of septicemia. This disease was very similarly described by Aretaeus and also Oribasius; the connection will be apparent enough in the following examples.[138]

It will be also useful to add an extract from Oribasius.[139]

Personal observation is always discernible, in all fields of pathology; a good instance is an adequate description of pregnancy toxicosis,[140] although nearly all of these observations are followed up by speculative discursions based on Galenic concepts.[141] It has to be noted that sound empiric Hippocratic ideas are never entirely obscured, as is proved by the illustration of pneumonia,[142] following precisely the Coan.

The short poem, "De Physiognomiis," intended to form part of "De Signis," deserves now a very brief consideration.[143] This poem is a descendant of the Hermetic literature; Gilles himself attributes his physiognomical sources to Aristotle,[144] Polemon,[145] and similarly to Rhazes.[146] The so-called Aristotelian physiognomic treatise is now known not to be Aristotle's work.[147] There is only one reference in the writings of the Stagirite to that subject[148] upon which probably medieval identification was based. However, it appears that the real source of Gilles was Apuleius[149] and that of Apuleius, Polemon the Rhetor,[150] as can readily be illustrated in a few illuminating parallels. Rose traced some of these connections and his work may be supplemented by establishing a connection between Gilles, the pseudo-Aristotle and Adamantius,[151] also an author of a physiognomic treatise. All these formed seemingly a great body or coherent system of physiognomic norms[152] which formed part of the Graeco-Arab tradition represented amply in our author. The whole of the work is characterized, as all similar writings are, by the curious symbolism and fantastic analogies drawn, respectively construed from observed facts. Such an example is given below, at the same time demonstrating the connections between Gilles,[153] Polemon,[154] Adamantius[155] and the pseudo-Aristotle.[156] These relationships can be followed without break in the texts.[157] The continuity of the traditional lore is nicely apparent in the series of passages relating to the physiognomic importance and significance of the neck.[158] That this was a strongly Arabized lore is shown, outside of the references to Rhazes,[159] in the presence of passages which have a counterpart in Rhazes for instance, but none in the Apuleian text.[160] The Apuleian text is the Western form of the Greek (Pseudo-Aristotelian-Polemonic) tradition which fell into the hands of the Arabs. The Latin form apparently did not share this fate. Gilles however, in Salerno, was in the fortunate position to get acquainted with both and that he availed himself of this opportunity, this work amply brings out in strong relief.

This kind of physiognomic literature was very popular throughout the Middle Ages. Treatises were composed in the thirteenth century (e.g., the "Physiognomics" of Michael Scot[161]) and even later. This desire for the symbolic, for the penetration of the mysterious barriers between the body and soul which the medieval mind so persistently craved, explains the longevity of this literature. It explains also the longevity of Gilles' poem.

This brings us to the end of this short survey of the sources and nature of the Aegidian books. Their importance, to state this again, lies not with their originality. They are not original. Their importance lies in two facts: first, that they represent the Salernitan medical tradition which it helped to perpetuate in the West; second, that they were widely used as textbooks and thus influenced medical thought and practice for three hundred years. These considerations justify the acquaintanceship of this medieval author.

References

1. Vieillard, C. Gilles de Corbeil. Paris, 1909.
   Vieillard, C. Les Médecins Urologues dans la Médecine Ancienne. Paris, 1903.
   Berthaud, Les médecins et chirurgiens des Rois capétiens du XIe au XIIIe siècle. *Bull. Soc. franç. d'bist. de la méd.*, Par., 1907, VI, 39.
   Naudé, G. De antiquitate etd ignitate Scholae Medicae Parisiensis panegyris a Gabr. Naudaci. MS. Bibl. Fac. Med. Par. 71487. Cited by Vieillard, C. Gilles de Corbeil, p. 16: ". . . veniat tandem aliquis genius . . . qui te Parisiensium medicorum antiquissimum numen, te Philippi Augusti a consiliis valetudinis principem, te demum vatum omnium qui a consulibus scripsere primum et elegantissimum dignis honorum titulis, digna laude, posteris omnibus, omnibus saeculis colendum studiose transmittet."
2. Hazon, Éloge Historique de la Faculté de Médecine de Paris. Par., 1773, p. 21.: "Gille de Corbeil, Médecin de Paris, Chanoine de la Cathédrale et Médecin de Philippe-Auguste."
3. It has been thought that he belonged to that family.
   Haeser, H. Lehrbuch der Geschichte der Medizin. Ed. 3, Jena, 1875, I, 673.
4. " . . . mea philosophis fer dona Salernis,
   Aegidio mittente suo."
   De laudibus, etc. II, 31–32.
5. Hochsalerno (Sudhoff).
6. Tiraboschi, G. Storia della Letteratura Italiana. Milan, 1823, IV, 312. Here are the passages referring to Romoald in "De laudibus et virtutibus, etc.," I, 131–139:

Hos Physicae Antistes, quos Aegidiana libellos
Sanctio produxit, digno Romoaldus honore
Consecret, et celebrat, qui ne penetrabilis aurae
Solvatur radiis, populo mirante, per aestum
Obnubit caput, et triplici domat astra galero:
In Physica celebrem, quem Justiniana favore
Divitis eloquii prudentia tempore longo
Detinuit, sed eum Romanae Curia sedis
Nunc colit auctorem physicae vitaeque parentem.

7. On Musandinus, in "De laudibus," V, 91–92:

Musandinus apex, quo tamquam Sole nitenti
Et nitet et nituit illustris fama Salerni.

In "De pulsibus":

Verba Musandino maneant condita sapore.

8. Ms of Musandinus' book in Bibl. nat. cod. lat. 6954. Under the designation of "De diaetis infirmorum secundum Magistrum Petrum de Musanda," Cat. Codd. mss. Angl. et Hib., i, 128, No. 2462. This work is part of the celebrated Salernitan stock, from which the "Regimen Sanitatis" issued; See The School of Salernum, Latin text and Harington's trans. ed. by F. Packard, New York, 1920.

9. Other references to Musandinus:
O utinam Musandinus nunc viveret auctor!
Ille meos versus digno celebraret honore . . .
Et quod in irriguis illius creverat hortis
Ipse meum sentiret olus, gustuque probaret,
Ex proprio sale doctrinae traxisse saporem.

10. Maurus, too, was engaged in literary work. mss. entitled: "Magistri Mauri [Salernitani?] tractatus de urinis" are extant: Bibl. nat. 6963, 6964. "Liber Phlebotomie secundum Magistrum Maurum," in Oxford, New Coll., 1135; See Tiraboschi, G., *Loc. cit.*

Suppleat et Petri Maurus mihi damna reformet,
Pastor ovem, membrumque caput, famulumque patronus,
Doctor discipulum, noscat sua mater alumnum.

This and other quotations show the strong feeling of loyalty and confidence of Gilles toward his old alma mater.

Cujus si fuerit resolutum funere corpus,
Spiritus occultat et magni pectora Mauri,
Tota replet. Maurus redimit, damnumque rependit
Prima quod in Petro passa est et perdidit aetas.

We see therefore that Maurus followed Musandinus as head master.

(May "Musandinus apex," ref. 7, be thus interpreted?)

11. Urso suum te concivem auderet [gaudebis?] adesse
Strenuus ambiguos causarum solvere nodos.
"De laudibus," 121–122.

12. Sigerist, H. E. Studien und Texte zur frühmittelalterlichen Rezeptlitteratur. Leipz., 1923, p. 187.

13. Breviarius Iohannis de Sancto Paulo, ed. in Egidii Corboliensis Viaticus, V. Rose, Leipz., 1907, p. 103; See Littré, E. Hist. litt. xxi, 408; Fabritius, Bibl. med. aev., v, 302.

14. Rose, V., *Op cit.* p. iv.
Rigord, in Recueil des hist., xvii, 53.
Hoveden, R., Ann. angl. Ed. by Stubbs, ii, 268.
Gilles on Johannes:

Mente bona mea Castalius decreta Joannes
Suscipiat, quem, dum pueriles volveret annos,
Myrtum humilem Musandino sub praeside vidi,
Audio nunc ipsum summis contendere lauris,
Et sua nobilibus aequasse cacumina cedris.
De laudibus, v, 126–130.

Another interesting reference of Gilles to his headmasters:

Claude Musandini torrentes fluminis undas,
Non ultra aequivoci gazas praelata Salerni
Sparge, nec Ursonis apices, nec dogmata Mauri.
(Carm. de urinis, epilogus. Ed. by Choulant, p. 18.)

15. Marini, Archiatres pontificii. i, 9, 10, cit. by Tiraboschi, G. *Op. cit.*, p. 316.
De Renzi, Henschel and Daremberg. Collectio Salernitana. Napoli, 1852–1859, i, 568.

16. O si tantum armis, quantum virtute vigeret,
Bellendi quantum medicandi praeminet arte:
Non ea Teutonici posset trepidare furoris
Barbariem. Non haec gladios nec bella timerat.
De laudibus, iii, v, 508–511.

17. Hunc celebri ritu medicandi provida morem
Excolit et digne veneratur terra Salerni,
Urbs Phoebo sacrata, Minervae sedula nutrix
Fons Physicae, pugil eucrasiae, cultrix medicinae.
De laudibus, v, 467–470.

Salerno always prided herself upon her classicism, which was indeed natural and legitimate at the doorstep of both Parthenope and Magna Graecia.

18. O nimis a ritu veterum, si dicere fas est,
A recto quoque judicio censura Salini [Salerni]
Devia, cum tolerati animo cum sustinet aequo
Nondum matures medicorum surgere plantas,
Impubes pueros Hippocratica tradere jura
Atque Machaonias sancire et fundere leges,
Doctrina quibus esset opus ferulaque flagello,
Et pendere magis vetuli doctoris ab ore,
Quam sibi non dignas cathedrae praesumere laudes.

See Hist. litt. France, xvi, 509; Carmina Egidii, Ed. by Choulant, 1828, cit. Hist. litt. *supra;* Berthaud, *Loc. cit.*

19. Hist. litt. France. *Loc. cit.*
Naudé, G. De antiquitate scholae Medicae. p. 35. Cited in Hist. litt., *Loc. cit.*

20. For regulations concerning the ages of theological licentiates see Chart. Univ. Paris., ed. by Deniflé and Chatelain. i, 20 *ad an.* 1215. The age of Bachelors and Licentiates in Medicine does not appear to have been regulated.

21. Astruc, J. Mém. pour servir à l'hist. de la fac. de méd. de Montpellier. 1767, p. 142. Cited in Chart. Univ. Paris, i, 517.
Hist. litt. xvi, 509. See also anonymous commentary on "De Urinis" (Ms 1024 Bibl. Ars.), cited by Pansier, *Janus*, Sept. 1904.
Vieillard, C. Gilles de Corbeil, p. 33.

22. See also Sudhoff, K. Geschichte der Medizin (Pagel). Berl., 1922, p. 187.

23. Hazon. *Op. cit.*

24. Verdier, Jurisprudence médicale. ii, 10, cited by Berthaud, *Op. cit.* Their significance and the esteem which surrounded them can be gleaned from this late distich:
Quem sibi Rex legit, Medicis ex omnibus, unum
Iam per vota, diu publicá, lectus erat.
Quae fortes, quae fata viro concredita! Regni
Dum venit, a salvo Principe, tuta salus.
Santeuil, ann. 1697.

25. Gregor. Ep. Toron. Hist. Francorum (ed. Omont and Collon), x, 436, Paris, 1913.

26. *Idem*, vii, 25, p. 274: "Marileifum vero, qui primus medicorum in domo Chilperici regis habitus fuerat . . ."; *idem.*, v, 8, p. 165: " . . . redeunte Marileifo, arcietro de praesentia regis . . . ."

27. He died around 1130. Hazon, *Op. cit.*

28. Mauger, archdeacon of Evreux, is said to have been archiater to Richard i of England. Hist. litt., ix, 192.

29. Jean de Chartres is mentioned by Bulaeus, Hist. Univ. Paris. Paris, 1665, i, 612, cited by Chevalier, U. Rép. Sources Hist. du Moyen-Âge, Bio-bibl. ii, 2385. It is not certain, however, that this is the archiater.

30. We have an interesting description of the royal physicians and surgeons at work on Richard i of England when mortally wounded in the siege of Chalus, 1199:
Interea Regem circumstant agmina mixtim,
Apponunt medici fomenta secantque chirurgi
Vulnus, ut inde trahant ferrum leviore periclo.
Guilleaume le Breton, Philippide. v, 598–600.
Recueil des hist. d. Gaules et de la France, xvii.
Pasquier, Recherches de la France. 1615, cited in Hist. litt., ix, 195.

31. Berthaud, *Loc. cit.*

32. Mansi, Conc. coll., xxi, col. 459: "Ipsi quoque [i.e. monachi et regulares canonici] . . . pro detestanda pecunia sanitatem pollicentes, humanorum curatores se faciumt corporum. Cumque impudicus oculus, impudici cordis sit nuntius: illa, de quibus loqui erubescit honestas, non debet religio pertractare . . . ." See d'Irsay, S. Teaching and practice of medicine in the medieval university of Paris, *Bull. Soc. med. hist.*, Chicago, in press.

33. *Idem*, col. 528 (Mansi). Text almost identical with the former.

34. *Idem*, col. 1179: " . . . statuimus, ut nullus omnino post votum religionis, post factam in aliquo religioso loco professionem, ad physicam, legesve mundanes legendas permittatur exire."

35. Migne, Patr. Lat. clxxvi.

36. Hist. litt., xvi, 37.
Vieillard, C. Gilles de Corbeil.

37. Bulaeus, Hist. Univ. Paris, 1665, ii, 718, cited by Berthaud, *Loc. cit.*
Panzer, Ann. typ., vi, 271, 746; vii, 282, p. 62; 340, 525; vi, 746, p. 271: Aegidii Monachi natione Graeci opuscula de pulsibus et urinis metrica. Basel, Wolff, 1529. Similarly listed editions from 1505. vii (1799), p. 340, No. 525: Aegidii Monachi Carmina de Urinarum, etc. Lyon, Myt, 1526, etc. Hist. litt., *ibid.* and xvi, 506 sqq. (Duval).

38. Duval, in Hist. litt., *loc. cit.*
Bernier, J. Essai de Médecine. Paris, 1689, chap. 4, pp. 126, 170.
Fabricius, Bibl. lat. med. et inf. aet. Florence, 1848, i, 20.
The passage in question is the following:
Fine libri clauso, portum tangente carina,
Quae toties, somno vacuas studiique labore,
Pervigiles multas traxisti sedula noctes,
Respirare potes et parcere, musa, labori.
Hos, pueri ac juvenes, Physicae quos Delphicus artis
Spiritus inflammat, curvatis pondere ramis,
Carpite maturos foecunda ex arbore fructus.
De laudibus, etc., v. 1460–1465.
Aegidius' self-assuredness finds adequate expression in this passage. The classicistic reference to the oracle is the cause of his confusion with a Greek namesake, according to Duval, q. v.

39. Vieillard, C., *Op. cit.*

40. Ars nova Parisie, studio concepta sophie,
Prodiit in medium . . .
Hierapigra, ix, 507; see Vieillard, C., *Op. cit.*, p. 36.

41. Urbibus urbs speciosa magis, bona cujus ad unguem
Commandare mihi sensus brevitate negatur,
Que caput est regnique grandia germina regum
Educat et doctrix existit totius orbis.
Guilleaume le Breton, i, v, 98. Recueil de hist., xvii.

42. Cum sit est hic alius nostrae non indecor urbi
Oris adornati, sola mihi junctus in usus
Nominis, in reliquis major meliorque gerendus,
Nominis ille mei celeberrimus arte medendi.
Aegid. Parisiensis Carolinus, Rec. d. hist., xvii, 288.

43. Aude aliquid, mea musa, novi, proscribe timorem,
Parcius arguti timeas censoris acumen,
Atque theonini morsus ad vulnera dentis
Aequa mente feras . . .
De Signis et sinthomatibus, etc. 1–4.
The reference is from:
. . . qui
Dente Theonino quum circumroditur, ecquid
Ad te post paulo ventura pericula sentis?

Horace, Epist. I, xviii, v, 81–83.
and: Theon quidam illo tempore rabiosae dicacitatis fuit . . . Porphyry
For commentaries: Obbarius, Q. Hor. Flacci Epist. Leipz., 1847, II, 455.

44. Zoile, nunc tecum mihi sit sermo ultimus, alta
Livor adit, virtutibus invidet, ardua carpit,
Sie mea livore perstringis carmina, monstras
Hoc ipso quod laude nitent, quod laurea nostri
Carminis extendet laudis decus. Ergo repone
Spicula livoris. Nam quem prosternere livor
Nititur extollit, et quod nocet expedit hosti.
Cum laedit sanat, cum saevit verbere mulcet,
Cum culpa culpam redimit, cum crimine crimen.
De laudibus etc., prol. IV, v, 59–69.

45. Guttura pomposo tumido Galone relicto
Qui Gallicanum, Crasso felicior, aurum
Sorbuit, argento mensas spoliavit et omnes
Divitias rapuit, harpyie more rapacis.
Ierapigra; see Le Clerc, Hist. litt., XVII, 333.

46. Philip Augustus and his son Louis were both threatened with excommunication by the Cardinal Legate. He was ordered by the King to leave France. Matth. Paris. maj. Angl. Hist. in Rec. d. hist. France, ad an. 1216; XVII, 720, 721. See also: Luchaire in Lavisse, Histoire de France. Paris, 1911, III, I, 149; Hist. litt., XXI, 843.

47. Chart. Univ. Paris. I, 7, *ad an.* 1208. Contains severe admonitions. The first break between King and Cardinal came in 1209.

48. Francia praeradiat regnis!

49. Ipse novo faveat operi, nec Parisiacas
Aestimet in dignum Physicam resonare camoenas;
Nam logicus ubi fons scaturit, ubi plenius artis
Excolitur ratio, sibi Physica figere sedem
Gaudet et ancillis non dedignatur adesse.
De laudibus, etc.

50. Le Clerc, Hist. litt., XVII, 333. The poem was discovered in the library of the Duchesse de Berry; it is extant only in MS., Le Clerc, *loc. cit.*, published extracts. *Vid.* Vieillard, C. *Op. cit.*

51. . . . succumbet et ipsa
De te composito mordax Girapigra libello,
Horum si similem mereatur habere poetam.

52. *ἱερὰ πικρά.*
Du Cange, Gloss. med. lat., quotes St. Jerome: "Vidi ego nauseam et capitis vertiginem antidota, quae appellatur *πικρά*, saepe sanari, etc." (Ep. 151). Gilles evidently uses it in the symbolic sense.

53. In: De reditu suo. (Flourished around the year 415.)

54. Raoul Tortaire (de la Tourte), died 1114? See Hist. litt., x, 85.

55. Vincent of Beauvais, Spec. hist. XXV, c, 89, 332; see also Thomas of Cantimpré, Bon. univ. de Apibus, I, 20, 8; Pierre le Chantre, Bibl. d. éc. d. Chartres, II, 398, etc.

55a. Map, Master W. De Nugis Curialium. Ed. by Tupper and Ogle, Lond., 1924.

56. Ecclesie doctor, bene qui docet et male vivit,
Est veluti campana sonans, quasi cereus ardens,
Et quasi crux infixa viis
The author was afraid of punishment for this work:
Et metuo ne me, secum pugnare parantem,
Mactet terribilis latebrosi carceris hospes.
Ierapigra, I, V, 11–12.

57. Adiice, quod medicis summae cultoribus aulae
Lucratur domini foecundos gratia quaestus,
Et cumulat donis, multosque acquirit honores.
De laudibus, IV, V, 1603–1605.
Naïve admission and advice! See also Vieillard, C. *Op cit.* 1909, p. 357 sqq.

58. Non albigensis heresis corruptio prava
Late bis senas adeo corrumperet urbes.
Ierapigra, VII: Hist. litt, XVII, 346.

59. Ierapigra, V, 1224–1226.

60. On Gilles, *Vid.* also: Almanach de la ville de Corbeil. 1789, p. 98; Graesse, Allg. Lit.-Geschichte. Dresden, 1842.

61. Haskins, C. H., Studies in the History of Mediaeval Science. Cambridge, Mass., 1924, p. 20 sqq.

62. *Vid.* d'Irsay, S. Annals of Medical History. In press.

63. *Vid.* the letter of a Montpellier student, Guy de Bazoches: Fournier, Statuts et privilèges, etc., Paris, 1891, II, p. 3. No. 880, Cartulaire de l'Univ. de Montpellier. App. 2, I, p. 700.

64. Died in 1058. Manitius, Geschichte der lateinischen Litteratur des Mittelalters. München, 1923, II, p. 618. To Alphanus Constantine the African dedicated some of his works. *Vid.* MS. Canterbury, No. 107: Tractatus Alfani Salernitanensis de quibusdam questionibus medicinalibus; Manitius, *Loc. cit.*

65. I am appending a few MSS. lists of well-known libraries. This can give us an idea of the diffusion of the books. *Vid. infra.*

66. Chart. Univ. Paris, I, 453, *vid.*, d'Irsay, S. Annals of Medical History, in press. The reading of the Versus was not made obligatory, still it appears that they must have been widely read.

67. Protospatharios to Emperor Heraklios in the seventh century, author of several medical writings, e.g., *περὶ τῆς τοῦ ἀνθρώπου κατασκευῆς.* *Vid.* Krumbacher, Geschichte der byzant. Litt. München, 1897, p. 614.

68. MS. Wien, National bibl. 5400, f. 32a–34b (fifteenth century). Contains also Michael de Savonarola's "Liber de urinis," an uroscopic

treatise, with the incipit: "Urina et aquositas superflua . . ." On Aegidian uroscopy, *vid.* Neuburger-Pagel. Handbuch der Geschichte der Medizin. Jena, 1902, I, 657.

69. *Vid.* d'Irsay, S., *Loc. cit.*
70. MS. Paris, fac. de méd. 58 (2046); Wien 5407; Cambridge: Gonville and Caius. 373–593, 32–21; Utrecht, Univ. 583; Bibl. nat. nouv. acq. 1486 (contains also Serapion); Rouen 978 (abbaye de Fécamp); *vid.* Haenel, Cat. libr. MSS. concerning the MS. in Lincoln Cathedral.
71. d'Irsay, S., The black death and the medieval universities. Annals of Medical History, VII, 220, and *ibid.*, in press.
72. Called also Gautier, Galterus Agilus, Walter, etc. author of the Liber pulsuum and Compendium urinarum, which closely follow the Aegidian writings. He is said to be a late thirteenth century Salernitan: Hist. litt., XXI, 411.
73. Makes his appearance in the early printed editions. *Vid. infra*, 84.
74. d' Irsay, S., Annals of Medical History, in press.
75. MSS.: Cambridge, St. Johns 99; all other MSS listed here are dated from the late fourteenth or fifteenth century: St. Augustine Abbey, Canterbury (*cit.* Thorndike, History of Magic and Experimental Science. N. Y., 1923, II, 479); Hunterian, Glasgow, 328 (a collection of various uroscopic commentaries, incipit: De nigra urina capitulum primum); Bibl. Ars. Paris. 1024; Auxerre, dép. 241 (with anonymous commentary); Utrecht, Univ. 680; Wien 5155, 5300, 4769 (the latter a pharmacognostic codex), 4772; Ste. Geneviève, Paris 3102 (containing the curious statement: "Iam sterilem cultum Phylareti nominis horret," written in Montpellier. But Theophilus is listed with other uroscopic books); Ars. Paris, 1080; Acad. de Méd. Paris 550. In Hist. litt. XVI, 509 sqq. few MSS. are listed under the designation: Aegidii cancellarii Parisiensis experimenta! For MS. in the Bibl. Mazar. see Cat. de MSS. de France, Mazar. III. pp. 138–146. An Edinburgh MS. (169) refers to Philaretes similarly to the Ste. Geneviève MS.; a feature of this codex is a portrait of Rhazes, incidentally.
76. Ars., Paris, 1024. On Alphanus *supra.*[4]
77. The standard version of the "De urinis" begins:

Dicitur urina quoniam sit renibus una,
Aut ab urit grece quod demonstratio fertur . . .

and the explicit:

Aggravat et cumulat mala circonstancia culpam,
Hinc mea completo respicet musa labore.

Vid. MSS. Bibl. dép. Reims 1001; Chartres, dép. 395; Reims 1006; Wien 2316; Bruges 468; Edinburgh 173. These are all thirteenth century MSS. *Vid.* Choulant, Carmina Egid. 1828, *cit.* Vieillard, *op. cit.* 1909.

78. MS. Codex Gudianus, in Wolfenbüttel. Haeser, *loc. cit.* and Rose, Egidii Corboliensis Viaticus, Leipzig, 1907, p. 9. According to Rose there is one MS. in London.
79. In 1777; Rose, *ibid.* Daremberg, Notices et extraits des MSS. médicaux, etc., Paris, 1853, p. 173 sqq.
80. Daremberg, *ibid.* under the name Signa et causae febrium, 471 lines. He published this according to the Bodleian MS. Cod. Canon. 455, of the fourteenth century. That MS. contains also works of late scholastic character, as: Bernard of Gordon, Gentile de Foligno, Pietro Abano and has also the Regimen Salernitanum which is ubiquitous.
81. Rose, *supra.* Published under the name of Viaticus. The poem consists of 2358 lines. Vv. 1–400 in Daremberg (*supra*,[19]), correspond to Rose, 2320–2358. Vv. 401–423 (entitled Signa febris pestilentialis) and the last nine lines are *not* contained in the Amplonian MS. published by Rose.[13]
82. Rose, Anecdota Graeca et Graecolatina, Berlin 1864, p. 171 sqq.
83. 5929 lines. *Vid. supra.*
84. Carmina de urinarum iudiciis edita ab excellentissimo domino magistro Egidio cum commento eiusdem felicitur incipiunt. Padua, Matthew Cerdone de Windischgraetz. Commented by Gentile da Foligno, edited by Avenantius de Camerino. See Brunet, Manuel du Libraire, Paris, 1861, II, 949–950.
85. Hain, Repert. Bibliogr. Stuttgart, Paris, 1826, I, I, p. 13; Graesse, Trésor de livres rares, Dresden, 1859, I, 22, Suppl. 1869, II; Reichling, Append. ad Hain-Copinger, Repert. IV, Emend. 100; V, 1431, München, 1908–1909. *Vid.* also Cat. Gén. de livres impr. Bibl. nat., Auteurs, IX, 353–354.
86. *Ibid.*
87. Bibl. poet. med. aevi., 1762.
88. Ref. 80, 81, 82.
89. *Supra.*

Hist. litt. XXI, p. 333 sqq. (Le Clerc.)

90. Van den Berg, Eene middelnederlandsche Vertaling van het Antidotarium Nicolai met den latijnschen Text der eerste gedrukte Uitgave van het A. N., Leiden, 1917. (Authoritative text of the 1471 edition.)
91. Das Salernitanische Antidotarium und seine Quellen, in Sigerist, Studien und Texte zur frühmittelalterlichen Rezeptliteratur. Leipzig, 1923, p. 187 sqq.

Vid. De Renzi, etc., Collectio Salernitana, I, 218 sqq., also Wickersheimer, *Bull. soc. franc. hist. méd.* 1911, p. 388.

92. Codex, Harlein. B. M., 5792, p. 273′–276″. (Seventh-eighth century.)

93. Hs. L. III, 6. (Ninth century half-uncial MS.)

94. Cod. Hunter. (Ninth-tenth century.)

95. Cod. Augiensis CXX. (Ninth-tenth century.)

96. Codex 44, pp. 228–260. (Ninth century.)

97. Codex Philippicus 1790, p. 37–39, 70–77. (Ninth-tenth century.)

The provenience of this is the Collège de Clermont of Paris. There is a possibility that this or similar MSS. might have been the sources of Gilles. *Vid.* ROSE, Verzeichniss der lat. Hss. d. kgl. Bibl. Berlin, 1893, No. 165, p. 362. Contains compilations from late Romans as those mentioned above.

98. SIGERIST, *loc. cit.*

99. Cod. 1302 (years 1160–1170), contains the Liber de confectione medicinarum, containing a great number of the prescriptions which appear also in the Salernitan Antidotary. *Vid.* BERNDORFF, Der Liber de confectione medicinarum im Breslauer Kodex, Diss. Leipzig, 1920; SUDHOFF, K., Die Salernitaner Handschriften in Breslau. *Arch. f. d. Gesch. d. Med.*, XII, 101 sqq.

100. STEINSCHNEIDER, Die hebräischen Übersetzungen des Mittelalters. Berlin, 1893, p. 650.

101. D'IRSAY, S. *Bull. soc. med. Hist.*, Chicago, in press.

102. STEINSCHNEIDER, *Op. cit.*, p. 791.

103. STEINSCHNEIDER, *Op. cit.*, p. 511. The Circa instans of Matthew Platearius (from its incipit, otherwise known as De simplici medicina), has its origins in Jewish-Arabic translations of the tenth century.

104. On Nicholaus *vid.* HELD, Nicolaus Salernitanus. Diss. Leipzig, 1916, *cit.* SIGERIST, *loc. cit.*; STEINSCHNEIDER, *Virchow's Archiv f. path. Anat.*, XL, 94; DE RENZI, etc., *op cit.* I, 219, etc.

105. STADLER, Die Quellen des Macer Floridus, *Arch. f. d. Gesch. d. Naturwissenschaften u. d. Technik*, 1909, I, 52. MANITIUS, op. cit., p. 539 sqq, identifies the author with Odo of Meung.

106. D'IRSAY, S., ANNALS OF MEDICAL HISTORY, in press.

107. SIGERIST, *loc. cit.*

108. In Book X of the therapeutic part (Practica.)

109. De laudibus, II, v. 297 sqq: 218–347.

In Venerem pronos quos olim fama notavit,
A satyris Diasatyrion nomen sibi traxit . . .
. . . . tardaeque iugalis
Confirmare sacros concordi foedera nexus.

Vid. also Vieillard, *op. cit.*, 1909, p. 60, p. 348.

110. 4663 lines, enumerating eighty medicaments.

111. *Supra.*

112. D'IRSAY, ANNALS OF MEDICAL HISTORY, in press. *Idem., Bull. soc. med. hist.*, Chicago, in press. Also the incipit:

Quae secreta diu noctis latuere sub umbra,
Clausa, verecundi signo celata pudoris,
Gesta sub involucris mentis, clarescere quaerunt.
Eruta de tenebris cupiunt sub luce videri . . .
Tecta patent. Obscura nitent. Scintillaque mentis
Fulgurat, accenditque novum fax ignea vatem.

Poetically valuable. *Vid.* Choulant, Carmina 1828.

113. The incipit:

Aude aliquid mea Musa, novi, proscribe timorem. . . . .
. . . . nam sola voluntas
Sufficit ad meriti pretium, cum posse negatur.

Classical reminiscence to: "in magnis et voluisse sat est."

114. Signat emitriteum maiorem quarta revolvens,
Et replicans tormenta dies discrimine magno.

De signis, vv. 2309–2310.

Galen, Defin. med. ("Ορoι ἰατρίκοι), 203:

οἱ δέ ἀπὸ τῆς μεθόδου ἡμιτριταῖον καλοῦσι τῶν δύο διαλειμμάτων, ἔφησαν. μέσον δὲ ἡμιτριταῖον καλοῦσι τῶν διαστημάτων τριῶν ἐφαπτόμενον. μεγα δὲ τῶν τεσσάρων ἐφαπτόμενον διαστημάτων, etc.

115. Sincopis est venarum plectora, mentis
Passio, defectus humorum . . . .

De signis, vv. 912–913.

Galen, Hippocr. de acut. morb. et Gal. comm., IV, 21:

'Απολήψεις φλεβῶν ὠνὸματι τὰς πληρώσεις τῶν φλεβῶν ὑπὸ πλήθους γινομένας . . . ἐπιληψίαι τε γὰρ καὶ ἀποπλεξίαι καὶ καρδιακαί συγκοπαὶ γίγνονται . . .

116. . . . si sicca sit eius
Materies, cum luna suis defectibus orbem
Diminuit, cedit. Si causa est humida, lunae
Cremento crescit morbus. Cum plena sit eius
Orbita, lex morbi motu redit orbiculari.

De signis, vv. 381–385.

117. THORNDIKE, *Op. cit.*, I, p. 755.

118. . . . vel noxius humor
In stomacho latitat . . .

vv. 355–356.

. . . stomachum cum noxia morbi
Causa replet, dolor accusat qui virus ibidem
Allegat latitare mali . . .

vv. 362–364.

119. Epilepsia que fit in incremento lune, humidam, que in defectu, naturam (materiam?) habet siccam.

Breviarium, cod. Amplon. 207, *cit.* ROSE, 1907, p. 17.

120. Pars Theorica, X, 9.

121. Galen. De Locis affectibus, lib. iii, cap. x. (Περὶ τῶν πεπονθότων τόπων): συμπεφώνηται δὲ τοῖς ἄριστοις ἰατροῖς, οὐ ταῦτα μόνον ἀπὸ τῆς γαστρὸς τῇ κεφαλῇ συμπίπτειν, ἀλλὰ καῖ τὴν ἐπιληψίαν.

122. Galeni quod fertur in Hippocratis de septimanis commentarium, ed. Bergstraesser, Leipzig, 1914. Particularly c. 23, 29.

123. Johannicii ad thegni Galieni liber ysagoge cum libro Philareti etc. . . . Lyon, Fradin, 1505, *vid.* Panzer, Ann. typ. vii, p. 282–283, No. 63.

124. Galen, Περὶ κρισίμων ἡμέρων (de diebus decretoriis), iii, 2. καὶ καρποὺς οὖν παχύνει καῖ τὰ ζῶα πιαίνει καὶ τὰς τῶν καταμηνίων ταῖς γυναιξῖ προθεσμίας διαφυλάττει καὶ τὰς τῶν ἐπιλήπτων τηρεῖ περιόδους, ἐξ ὧν ἡλίον πλὲον, ἢ ἔλαττον μεταλαμβάνει.

125. Catal. codicum astrologorum graec., Codd. Mediolanenses, Bruxelles, 1901, p. 32 sqq.

F47: Προγνωστικὸν περὶ ἀρρώστων. ψῆφος τῆς Σελὴνης.

F67: Ψῆφος τῆς ιδ. σύντομον κράτος. τῶ α. κυριακῆς ἤγουν τὸ τε τῆς Σελὴνης.

Codd. Venet. Libr. S. Marc. 334. (Dorotheus Sidonius.)

F143: sτπόθου τὸν ὡροσκόπον τὸν νοσοῦντὰ, τὸ δὲ δῦνον τὸν τὸπον οὗ ὁ νοσῶν κατάκειται καὶ αὐτῇν τῇν νόσον ὁποία τις ἔσται, τὸ μεσουράνημα τὸν ἰατρόν, τὸ ὑπὸ γῆν τῇν ἀπόβασιν τῆς νόσου. ὢs αὔτως καὶ ἡ Σελήνη σημαίνει τίs ἡ νόσος καῖ ποία καὶ τίs ἡ αἰτία αὐτῆs . . .

. . . βλέπε δὲ καῖ ποῖος ἀστὴρ ἐποίησε τὴν νόσον ἤτοι τὸν πρὸ ὀλίγων ἡμερῶν τῆs νόσον δυτικὸν γενόμενον ἢ ὕπαυγον τετραγωνίζοντα τὴν Σελήνην ἢ διαμετροῦντα καὶ βλέπε πότε τὸ σχῆμα ἀλλάσσει ἤτοι εἰs ἀνατcλὴν καὶ τὰ λοιπὰ σχήματα, καὶ τότε ὑγεία τῷ νοσοῦντι ἔσται.

126. Hipp. Aphor., xiv. τῶν ἐπιληπτικῶν τοῖσι νὲοισι ἀπαλλαγὴν αἱ μεταβολαῖ τῆs ἡλικίηs καὶ τῶν χωρίων καὶ τῶν βίων ποιὲουσιν.

127. Si patitur puer, hunc absolvit grandior aetas. De signis, v. 413.

128. Galen, Comm. in Aph. Hipp.

129. Punctio, pruritus, salsedo tincta colore
Prorsus citrino, mediocri spissa liquore
Quatuor humorum faex, venae fortior ictus
Pulsantis, sitis affectus, defectus edendi,
Flegmatis haec salsi vim signant praedominantis.

Or: Hic dolor aestatis comes est, et saevius instat.
Cum colerae rabies motus sibi vendicat horam.
vv. 113–114.

130. Urinae color intensus, substantia spissa . . .

131. Sputamina multa, nausea . . .
Secessus fluidi, cum muscillagine mixta
Cruda superfluitas . . .
vv. 31–32.

Galen, περὶ φυσίκων δυναμὲων, ii, ix, 139. τὸ δ'ἐξ ἐγκεφάλου καταρρὲον περίττωμα.

132. Destruitur virtus motiva, superstite solo
Motu pulmonis, qui cordi debita solvit
Aere spirato . . . De signis, vv, 297–299.

. . . .

Officium cessat sensus, nec lingua loquendo
Interpres mentis animi secreta recludit,
Nec rerum formas oculus rerumve colores
Suscipit inpressos, nec pervia vocibus auris
Dat verbis aditum, nec discretivus odorum
Deservit sensus animae, nec lingua saporum
Gustando species examinat, omnibus una
Artubus unitis tactus vacat. Obluit ora
Spuma citae praesaga nacis, conamine tractus
Aer stertenti subigit spiramina nari.
vv. 301–310.

The expression "lingua . . . animi" is taken from Lucretius.

133. Aretaeus, Chron. Α'ιδ': εὔλυτος γὰρ καὶ φύσι σπλὴν.

134. Spiritus interdum languentis magnus et altus,
Interdum angustus multum, curtusque frequensque . . .
ed. Daremberg, vv. 402–403.

Aretaeus, Ac. Α' κθ': ἀναπνοὴ εἴσω μεγάλη.

135. Sitis ingens (Gilles): δὶψος, ὡs ἐκ πυρόs. Aretaeus.

136. Almansor, x, cap. 18, Continens xviii, cap. 8, 6. (Although the latter deals with measles.) *Vid.* Greenhill, Rhazes' treatise on small-pox and measles. London, 1848, p. 77, etc. Rhazes was translated partly by Constantine: Abubecri filii Zacharii Rhasis Divisionum liber, Interprete Constantino, ms. Oxford, St. Johns, Coxe ii, 85. Gilles knew Rhazes therefore very well; he refers to him:
Divine miranda Rasi documenta recensens
. . . Physiogn. v. 34.

Vid. also: Razae libellus de peste de Graeco in Latinum sermonem versus per Nicol. Macchellum, Venice, 1556; original mss. of this work in Leiden, 761 (Catal. libr. Bibl. Lugduno Batavae 1716): Naniana, Venice, Catalogo de Cod. ms., della Bibl. Naniana, etc. ii, p. 239.

137. Ed. Daremberg, vv, 401–402. Gasquet, The Black Death, London, 1908, p. 7, claims that the expression atra mors is of much later date and that it first appears in Rerum Danic. Historia, J. J. Pontanus, 1631, p. 476. The above lines do not seem to bear out that statement! *Vid.* d'Irsay, S. *Isis*, in press.

138. Ed. Daremberg, vv. 265–276.

Compare the obvious parallelism in the following passages:

Putrida materies qua causon destruit artus
Clauditur in vena gracili que proxima cordi

Pulmoni, jecori, stomacho, loca continet; hujus
Collige signa, siti nimia, nigredine lingue,
Fervoris flamma, stimulo vehemente doloris,
Pulsu veloci, duro, qui fortiter instat
Et crebro; multa, tenui mediocriter, atque
Spumosa fece jecoris, tinitibus auris,
Insomnes oculis horas decentibus omnes
Et modica requie . . .

Aret. Ac. B′. ζ′περὶ θεραπείας ὀξέων. Τὴν τῆς κοίλης φλεβὸς φλεγμασίην καὶ παχείης ἀρτερίης αἱ παρὰ τὴν ῥάχιν τέτανται, καύσου ἰδέην ἐκάλεον οὐ προσθεν.

. . . .

Ἢν δὲ ἐπὶ μᾶλλον αὔξῃ τὸ πάθος, μέζω τὰ πάντα καὶ κακίω. σφυγμοὶ σμικρότατοι καὶ πυκνότατοι, γνώμη παράφορος, πάντων ἀγνωσίη, διψώδεες. . .

ἀγρυπνίη . . .

ὀφθαλμοὶ ἔυαγίες, λαμπροὶ, ὑπέριθφοι.

Καυσωδῶν διάγνωσις. τοῖς καύσοις παρακολουθεῖ συμπώματα γλῶσσα μεν ξηρὰ καὶ παχεία καῖ μέλαινα, δῆξις δὲ τῆς γαστρὸς καὶ ὑποχωρήματα ὠχρὰ καὶ δίψα σφοδρὰ καὶ ἄγρυπνία, ποτὲ δὲ καὶ παραφροσύνη.

De urinis; vv. 194–195:
. . . figurat
Causonidem si plus tenuis quam spissa.

οὖρα λεπτὰ, ὑδατωδέα.

Paulos Aegineta, II. 29:

139. Oribasii Synag. (Ἰατρικῶν συναγῶγων.)
libr. XLV–, 26, I. καύσων διὰγνωσις.

Δύο δὲ καῦσοι εἰσὶν, ὡς οὕτω φᾶναι, ὁ [μ] τὰ εἴσω καίει, [καὶ] δίψος γε ἄπαυστον ἔχει, καὶ οὖρα μέλανα καὶ ἡ γαστὴρ τὸ [μ] ἄνω ὕπερβάλλει χολὴν παντοδἄπήν, τὸ δὲ κάτω ἐκδίδωσιν ὁποῖα συντήξεις ὀνομάζομεν, καὶ μυκτήρ τε ἀποστάζει, καὶ ἡ γλῶσσα τραχύνεται καὶ μελαίνεται. καὶ ἄσηροι .καὶ παράληροι . . .

140. . . . variis affectibus escas
Exposcit stomachus, succedit nausea . . .

141. In the above instance he attempts the prediction of sex.

142. . . . stat passio fixa
Per septem protensa dies et protrahit horas
Ulterius, donec cessante causa resumat [sic!]
Virtutis natura suas . . .
vv. 323–326.

Although this may be applied to other conditions, the Hippocratic origin is clear.

143. Rose, Anecd. Graeca, etc., *Op. cit.* p. 177.
Incipit:
De discernendis crasibus, de certificandis
Discrasiis cerebri per signa domestica recto
Ordine disserui . . .
(Regarded later as Book IV, of De signis.)

144. Nam cui notitie famulantur physonomie.

145. Quisquis Aristotelem doctique Polemonis artem
Providus explorat et eas implere laborat . . .
vv. 197–199.

146. Divini miranda Rasi documenta recensens
Ac Peripatetice problemata physonomie
vv. 34–35. *Vid.* ref. 145, *supra.*

Galen and Johannitius are further cited as sources:

Ac varius alucus, medios quos esse colores
Proposuit rudium nutrix ysagogicus actor,
Quamvis per glaucum Galienus senserit album,
Significant mixtas in se concurrere causas.
vv. 830–833, also 859.

147. Ross, Aristotle, New York, 1923, considers it to belong to the third century B.C. *Vid.* Förster, De transl. lat. quae feruntur Arist., 1884, in Jahresberichte über d. Fortschr. d. klass. Altertumswissenschaft (Bursian's Berichte), 146, 1909, p. 306; Christ, Geschichte d. griech. Litteratur, München, 1905, p. 487, derives it from the second century A.D., because Dionysos is mentioned in it (c. 3.): καὶ τῶν ὀμμάτων περιβλέψεις οἷος ἂν εἴη Διονύσιος ὁ Σοφῖστής. Förster, Philol. Abh. zu Ehren v. Hertz, p. 283; *idem*, Neue Jahrb. f. Philol. u. Päd., Jb. f. class. Phil. Suppl. XV, *557*; Jourdain, Recherches, etc.

148. Prior anal., II, 27, 708b: τὸ δὲ φυσιογνωμονεῖν δυνατόν ἐστιν, εἴ τις δὲδωσιν ἅμα μεταβάλλειν τὸ σῶμα καὶ τήν ψυχήν, ὅσα φυσικά ἐστι παθήματα.

149. Rose, V. Anecd., *Op. cit.*

150. Polemon of Laodikea flourished around 131 A.D., *vid.* Wilamowitz-Möllendorf in Die griechische und lateinische Litteratur und Sprache. Berlin, 1905, p. 178.

151. Adamantius Sophista, in Corpus Script. Physiogn., ed. Franzius, Altenburg, 1780.

152. The Pseudo-Apuleian treatise (ed. Rose, *Op. cit.*) begins thus: Ex tribus auctoribus quorum libros prae manu habui, Loxi medici, Aristotelis philosophi, Polemonis declamtoris, qui de physiognomia scripserunt, ea elegi quae ad primam institutionem huius rei pertinent et quae facilius intelligantur . . .

153. Os spatio maiore patens, quod subteriori
Plus circumciso castigatoque manente,
Porrigit et labrum cogit prostare supernum
Magnanimum fortem designat, ad ardua promtum:
Talis magnanimo concordat forma leoni.
vv. 284 sqq.

154. I, 14: χείλη χαλαρὰ ὡς ἐπὶβεβλῆσθαι τῶ κάτω τὰ ἄνω, μεγαλονοίαν, καὶ ἀνδρείαν δηλοῦσί. Τῶν γὰρ λεόντων τοιαῦτα τὰ χείλη. Τὰ γὰρ λεπτὰ χείλη, ἐπὶτὸ μεῖζον αὔτων στὸμα ἐπιτείνεται. Εἰ δὲ ἐπὶ μικροῖς στόμασι λεπτὰ εἰσι χείλη, δειλὸν, ἄνανδρον καὶ δολεζον σημαίνουσι.

155. II, 17: . . . . χείλη δὲ λεπτὰ, ἐπὶ στόματι μείζονι, ἐπὶ (δὲ) τῇ συγχειλία χαλαρά, ὡς ἐπιβεβλῆσθαι τοῖς κάτω (τὰ) ἄνω, μεγαλονοὶαν, καὶ ἀνδρείαν δηλοῖ. λεόντων

γὰρ τὰ τοιαῦτα. Χειλη δὲ ἐπὶ μικροῦς στὸμασι λεπτότερα δεινῶς, ᾄνανδρον καὶ δολερόν . . . .

156. VI. Oἱs *τὰ χείλη λεπτὰ, καὶ ἐπ' ἄκραις ταῖs συγχειλίας χαλαρά, ὠς ἐπὶ τοὺ ἄνω χείλους προς τὸ κάτω, ἐπιβεβλῆσθαι τὸ προς τὰς συγχειλίας, μεγαλόψυχοι. ἀναφέρεται ἐπὶ τοῦς λεοντας.*

157. Grande caput frontis late vultus spatiosi
Indocilem tardum pigrum probat atque benignum.
Emula porcine frontis frons strictior equo
Indicat indocilem, spurcum probat atque voracem . . .
Cui frons longa, canem picturat imagine frontis
Fitque satis docilis et pollet acumine sensus.

vv. 107 sqq.

Pseudo-Aristotle, VI: Oἱ *τὸ μέτωπον μικρὸν ἔχοντες, ἀμαθεις. ἀναφέρεται ἐπὶ τοὺς ὗς . . .* (Oἱ *δὲ μέγα ᾄγαν ἔχοντες, νωθροί. ἀναφέρεται ἐπὶ τοὺς βούς*) . . . , Oἱ *μικρότερον ἐπίπεδον ἔχοντες, ἀναίσθητοι. ἀναφέρεται ἐπὶ τοὺς κύνας.*

Compare again the parallelism in these passages.

Also: Gilles, vv. 313–324.

Qui male prolongat mentum perverse figurat
Et castigandum potius portendit ad unum;
Est iracundus, perturbante rationis,
Attonitus mentis, ire datus atque furori;
Quodsi succinctum fuerit niminemque recisum,
Illum cuius erit denuntiat esse cavendum,
Quod serpentini latitant in pectore mores.

Adamantius, II. M*ακρογένυες οὐ πάνυ κακοὶ λαλίστεροι δὲ πὲρα τοῦ δέοντος, καὶ ὑποχαυνότεροι.* O*ι δὲ μικρογένυεѕ́ κακοὶ τὰ πὰντα, μάλιστα δὲ ὠμοὶ, καὶ ἐπίβουλοι-καὶ γὰρ οἱ ὄφεις τοιοῦτοι.*

Gilles, v. 474.

Quisquis habet oculos parvos nimiumque profundos
Callidus invidus est deceptor et insidiosus.

Adamantius, I. "O*φθαλμοὶ μικροὶ ὑπότρομοι γλαυκοὶ, ἀναιδεις ᾄπιστοι, ἄδικοι τὰ ἀλλότρια πράσσοντες κακά, ζῶντες ἀπὸ συμφορῶν.*

158. Pseudo-Aristotle, VI. (Later commented by Averroës): 'O*σοι τὸν τράχηλον παχὺν ἔχουσιν, εὔρωστοι τὰς ψυχάς. ἀναφὲρεται ἐπι τὸ ᾄῤῥεν.* "O*σοι δε λεπτὸν, ἀσθενεῖς. ἀναφέρεται ἐπὶ τὸ θῆλυ.* Oἷs *τράχηλος παχὺς καὶ πλέως, θυμοειδεῖς. ὀναφέρετα ἐπὶ τους θυμοειδέῖs ταύρους.*

Adamantius, II, 16: T*ράχηλος, ὁ μὲν πάνυ μακρος καῑ λεπτὸς, δειλῶν καὶ κακοήθων. ὁ δὲ παχὺς ἄμα μήκει, θυμικῶν καὶ μεγαλαύχων, αὐθαδῶν τε. ὁ δὲ μετρίως μήκους ἔχων, καὶ πὰχυς, εὐπαγήs τε καὶ ρωμαλέος, αλκίμων, πανούργων, κακομηχάνων.*

Polemon, I, 15: T*ράχηλης πάνυ λὲπτος, δειλὸν, καὶ κακοήθο ἄνδρα σημαίνει, εἰ καὶ μικρὸς ὑπάρχει.* 'O *δὲ παχὺς ἅμα καὶ εὐμήκης, θυμικὸν ἄνδρα, καὶ μεγαλαυχὸν, καὶ αὐθάδη σημαὶνει.* 'O *δὲ μήκους μετρίου, καὶ πάχους μετρίου ἔχων, ἐστι δὲ εὐπαγὴs καὶ ἰσχυρὸς ὁ τρὰχηλος, σημαίνει ἰσχυρὸν, εὐμαθῆ, καὶ εὐφυῆ προς ἀρετὴν ἄνδρα.*

Pseudo-Apuleius, 40: Cervix longa et tenuis timiditatem et malignitatem declarat. Vasta cervix cum prolixitate animosum iactantem superbum asseverat. Quae ergo moderata et prolixa et vasta cervix est ac minus rotunda et virtutem animi approbat et habilis est corpore. Cervix quae soluta et invalida est, nocentes et insidiosos homines praedicat . . .

Gilles, vv. 320–323:

Si fuerit tenuis multum prolixaque cervix
Conceptum pravos animi notat atque malignos.
Quodsi vasta simul erit et prolixa, figurat
Magnanimum cuius suspirat ad ardua virtus.

159. *Supra.*

160. Rose, V. *Op. cit.*

Cum bonus in rubeum vergens color afficit ungues
Pro manum forma spatio maiore patentes . . .

vv. 920–921.

Rhazes, Secretum secretorum: In manum linearibus constat indiciis, quam alibi diligenter exposuimus . . .

Vid. also Ad Almansorem., *cit.* Rose, *op. cit.*

161. Liber de physiognomia, quem compilavit Michael Scottus ad preces domini Frederici Romani imperatoris. Oxford, Coxe MS. III, Bibl. Canon. 555, 2. First printed in 1495. *Vid.* Wüstenfeld, Übersetzungen arabischer Werke in das Lateinische, Abh. d. kgl. Ges. d. Wiss., Göttingen, 1877, p. 100.

CARL ROKITANSKY THE PATHOLOGIST*

THE INFLUENCE OF HIS WORK ON MEDICAL PROGRESS

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IN days gone by, as well as the present, London, Paris, Vienna and Berlin have been the Meccas of medical learning towards which many physicians have directed their attention, in the hope of rounding out their medical education and embellishing the armamentariums of their practices. Their patients, too, soon learned the value of their having studied abroad, and so doctors young and old have endeavored, and are still exerting every effort, to bask for a brief spell, at least, in the halls of learning of England and the Continent. For there are recognized men, who, by force of their own efforts coupled with that of an obliging state, have been constantly developing new ideas in the steadily growing science of medicine.

Among those of the nineteenth century was Carl Rokitansky, prosector at the Allgemeinen Krankenhaus of Vienna and founder of the so-called Austrian medico-anatomical school. He was born at Königsgraetz in Bohemia, February 11, 1804, studied in the Gymnasium at Leiternitz, the Hochshule at Prague and Wien, and took his doctor's degree at Vienna in 1828 at the age of twenty-four. Shortly afterward he became an assistant in the department of pathological anatomy, and in 1834 professor of pathological anatomy, prosector at the Allgemeinen Krankenhaus (combined civil and military hospital), and medico-legal anatomist of the metropolis.

At this time the center of medical learning resided in the French school at Paris. Modern medicine as a whole had advanced to an enviable status. Garrison[1] aptly attributes this progress to (1) the intellectual and moral liberty following the French and American revolutions; (2) the establishment of the doctrine of the conservation of energy by Helmholtz, in 1847, and the origin of the species by Darwin in 1859; and (3) the establishment of physics, botany and chemistry as objective laboratory studies.

Following these scientific advances men and women struck out boldly into new fields seeking earnestly the causes of disease by objective as well as subjective considerations. The doctrines of spiritism and Arabian mysticism began to fade until finally even the nature philosophy of Immanuel Kant gave way to that of Schelling, who helped to emphasize the rapidly growing conviction that at least in part the truths of any science are born from impressions coming through the senses.

The Paris school of medicine was perhaps the most advanced or prominent in the early nineteenth century. Here Lewis and Bretonneau studied and named the disease typhoid fever (1828). Here Laënnec had discovered the stethoscope (1819) and had written fluently and accurately on diseases of the chest. Corvisart and Bouillaud had made decisive advances in the study of cardiovascular disease. Pinel had succeeded in convincing his colleagues and the authorities "that the insane were really sick and entitled to care in asylums rather than the ridicule and abuse of the public and confinement in jails."

The skeptical Ricord had become versed in venereal diseases (1838) and enriched his mistrust in mankind by so doing. Oliver Wendell Holmes regarded him as the "Voltaire of pelvic literature, a skeptic as to the morality in general, who would have treated Diana with his mineral specifics and ordered a course of blue pills for the Vestal Virgins." Willan had classified skin diseases according to their objective appearances and developed a suitable nomenclature. All in all, clinical medicine had made some decided advances and had attained an onward movement through the efforts of the French clinicians.

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[1] Garrison, F. H. History of Medicine. Ed. 3. Phila., 1921.

In England, the outstanding medical studies and advances were made by a small group of men who worked largely at Guy's Hospital. Notable among these were Bright, Addison and Hodgkin, who had made detailed studies of many conditions, chiefly nephritis, pernicious anemia and lymphatic disease, respectively. Here there was an attempt made to correlate the clinical symptomatology with autopsy findings, a distinct step in advance, an undertaking weakly attacked in France, but one which was gradually gaining ground in a limited way and receiving its stimuli from advances that resulted. At Dublin, Graves (1835) and his colleague Stokes (1848) were engaged in the study of thyroid diseases, and heart and blood-vessel diseases, respectively. Graves was instrumental in introducing Continental methods of study here.

C. Rokitansky

Portrait of Rokitansky in 1848 and His Signature.

Up to this time German medicine had not advanced to any great extent. There were a number of reasons for this. Probably the most significant and important was the fact that there were many schools dividing the thoughts and efforts of German men of science at this time. As has been pointed out by Garrison, one must consider the exhaustion of the German resources by the Napoleonic wars and the resulting establishment of a military régime as having an influence. Here clinical medicine was also dominated by native natural philosophy, resulting in the creeping in of a long botanical and zoological terminology in the classification of disease. This served to develop an heterogeneous group of quacks and pseudoscientists who allied themselves with schools of phrenology, rademacherism, homeopathy, braunscheithism, hydropathy, odic force, animal magnetism or some of the other schools brought into existence by confused minds that had developed from unguided study of the many new things that were slowly being brought to light.

There were, however, certain workers who were applying themselves to the fundamentals of medical sciences with a renewed energy. Such well-known men as Wunderlich, Henle, Müller and Schwann were busily engaged in the eliciting of new physiological and anatomical facts and pointing out their values in medical considerations. While their work bore fruit at a later date, they were for a time submerged by the fetishes of botanical medicine and the dissociated feverish efforts of others less conscientious and careful. So that in the first forty years of the nineteenth century there were no accomplishments of note in German or Austrian medicine.

It might be said, then, that in the nineteenth century startling developments were beginning to take form in the knowledge and practice of medicine. Beginning with dissections, the study of anatomy, physiology and pathology, the discovery of the microscope, the evolution of botany and zoology, and the gradually growing sciences of physics and chemistry, massive collections of facts were gradually yielding extensive archives of learning. Incidentally the "wheat was not often sifted from the chaff," so that the man of science standing at the threshold of this age was compelled to exercise an unusual ingenuity in building knowledge of a newer, more solid character from the heterogeneous contributions of widely scattered sources in all parts of the world.

Such was the general status of science when the young, vigorous and ambitious Rokintansky arrived at Vienna to begin his duties and studies. He had already demonstrated his individuality and independent spirit, for his departure from Prague was due to the fact that Purkinje took no particular interest in his students, so that Rokintansky, as one of them, could not learn as much anatomy as he desired.[2] But Vienna, in spite of its being a center of medical education, had not yet developed to a very high degree. As late as 1845 von Berufmen still spoke of healing by magnetic means, and this, too, with the sanction of his Viennese confreres. Medicine, in Austria as everywhere else, had not reached the plane of a true science, but, as Schnitzler[3] expressed it, was "more of a healing art consisting of practical experience on the one hand and theory on the other."

The immediate situation in which Rokitanksy found himself as prosector was created through the kindly disposition of Franz Josef, Emperor of Austria. By his order there was created the Allgemeinen Krankenhaus which was a combined civil and military hospital. All patients who came to this institution were accordingly under military rule.[4] As early as 1794, there was begun a private collection of pathological specimens by the Krankenhaus dissector Melly. In the year 1796, through the efforts of Johann Peter Frank, this reached considerable proportions. For several years the collection fell into the hands of a *diener*, but in 1812 through the effort of von Sifft a new museum was founded and the permanent position of prosector was established. To this position Dr. Biermayer was the first to ascend. In 1828 the latter was replaced by John Wagner who seemed to be sufficiently unpopular to cause an order to be issued making the position of prosector, to which the title of Professor of Pathological Anatomy was now attached, one of a four-year tenure.

Stricker[5] points out that early in his work as prosector, Rokitansky began to comment upon the necessity of the knowledge of the finer structure of the diseased organs. It appears that Wagner was presented with a microscope but used it little. This was also true of Rokitansky, who failed to use it until after the publication of his "Handbuch der pathologischen Anatomie," at which time the literary and scientific lashings given him by the sagacious Virchow undoubtedly served to stimulate his activity in this direction. But no one, as has been said, produced more lasting knowledge with his microscope than Rokitansky did by his methods. He pointed to the division of muscle bundles to effect a direct transmission into connective tissue union. He also described hyaline changes in connective tissue. Many other such minute studies, which have not been much improved upon up to the present time, were made.

In 1828–1832 Rokitansky studied internal intestinal hernias, and this work was submitted as his doctor's thesis. The fact that Wagner, who studied the same subject, gave him a limited number of specimens did not deter him. Instead he referred the fact that his chief had seen many more cases and had described them. Rokitansky's second publication dealt with "Intestinal Intussusception." In both of these there appeared evidence of a developing logician who attempted to seek out the cause of disease, and who, like his superior, yet with keener judgment and greater precision, spared no effort in analyzing clinical symptomatology in terms of postmortem findings.

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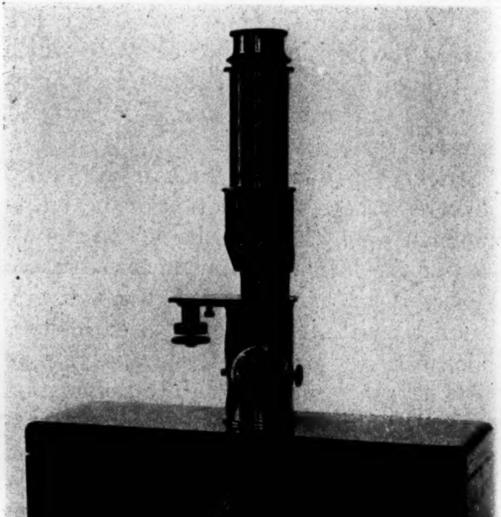
[2] Weichselbaum, A. *Wien. klin. Wchnschr.*, 1898, XXIII, 559.

[3] Schnitzler. *Med. Press.*, 1874, p. 185.

[4] *Wien. Ztschr.*, 1879, p. 141.

[5] Stricker. *Wien. med. Ztschr.*, 1879, p. 141.

No one since the time of Morgagni had delved so deeply into the study of pathology at the autopsy table as did Rokitansky when he finally acquired his title and position as prosector in 1834. His necropsies were carried out according to a certain plan. With the assistance of Skoda the routine of (1) pathologic morphology, (2) etiology and pathogenesis, (3) symptomatology, and (4) therapy, was carried out in each case treated and studied. This method angered the nosologists, men of practical experience and natural philosophy, to the extent of their attempting to have the doctor's certificates of Rokitansky and Skoda taken away.



ROKITANSKY'S MICROSCOPE.

During the years from 1842 to 1846 Rokitansky gave to the world his "Handbuch der pathologischen Anatomie" in three volumes. Up to this time microscopic study had been advanced by Purkinje, Müller and Schwann. Chemistry had been furthered by Liebig and Wöhler. Stimulated by the facts such work brought to light, Rokitansky, who constantly strove to clarify, reached out, as Weichselbaum puts it, "to further explanation and into error." He evolved his doctrine of the "crases of dyscrases," by which he attempted to lay a chemical foundation for his conceptions of disease processes. One may convey his notion best by quoting from the first volume of his Handbook of Pathology as translated by W. E. Swaine:

BLOOD DISEASES—DYSCRASES

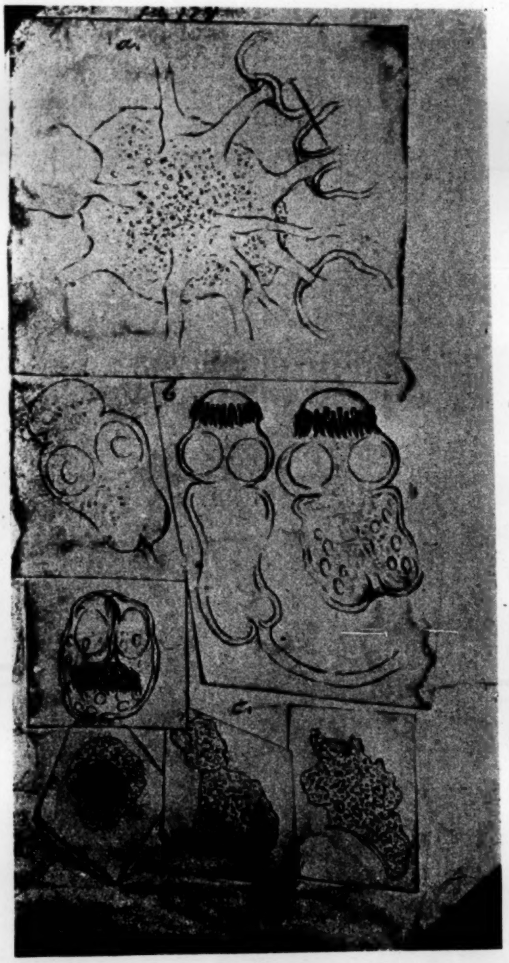
Humoral pathology is simply a requirement of common practical sense; and it has always held a place in medical science, although the limits of its domain have, no doubt, been variously circumscribed or interpreted at different times. Of late years it has met with a new basis and support in morbid anatomy, which, in the inadequacy of its discoveries in the solids to account for disease and death, has been compelled to seek for an extension of its boundary through a direct examination of the blood itself.

Not alone has pathological anatomy demonstrated the existence of blood diseases in unlooked for detail; it has at the same time solved a problem of the weightiest import. It has, we think, decided in favor of an humoral pathology, by demonstrating a primitive anomaly of blastemata; by demonstrating the endogenous impairment of the blood within the vascular system, in inflammatory process, as the basis of the variations in exudates (blastemata): lastly, by demonstrating the dependence of local morbid action upon pre-existent impairment of the general circulation. Our attention will be directed to the diseases of the blood in its totality, and to local dyscrasial processes, with inflammation at their head, only in so far as these offer the basis and starting-point, for consecutive disease of the entire blood mass. It is remarkable, however, and no less important for practice than for science, perhaps, that the essential forms of these local dyscrasial processes, perhaps of all local dyscrasial disease, occur, likewise, as primitive affections of the entire blood-mass. This is proved by the varied character of the products of the inflammatory dyscrasial process, and a comparison in detail of these products with anomalies of the general blood-crasis. Thus, primitive pyaemia, fibrin-crases, sepsis of the blood, severally occur independently of all local beginning, and of all infection.

This was the thing that excited Virchow.[6] He knew far more chemistry than did Rokitansky and was at that time enunciating his doctrine of *omnis cellula e cellula*, which was based upon microscopic study and earned for him the title of the "Father of Cellular Pathology." Virchow in a most vitriolic manner laid bare the fallacies of Rokitansky mentioned above, but candidly admitted that when it came to gross pathology his Viennese contemporary was far superior in his keen observations and deductions.

It must be remembered that most of Rokitansky's studies were with the unaided eye. Later, ever striving for the truth, he began to make microscopic studies, and once satisfying himself, he accepted the solidity of Virchow's doctrine, "rewrote his handbook and cast his doctrine of the Blastemata and Crasis aside." As Garrison says: "Posterity is inclined to direct its admiration at the work which was strictly his own and sees in his remarkable ability to depict the relationship of findings at the autopsy table with those at the bedside the meritorious efforts of his calling."

He continued to collect specimens for the museum as well as to devote himself to the revisions of his books, the material for which emanated from his dissection room. All of this time he was constantly segregating material for future study and publication as well as teaching those who gathered around him. His textbooks were written according to a scheme which gives us an insight into the organized plan under which he carried out his investigations. He discussed the subject from the standpoint of anomalies of form, position, connection, color, consistency and continuity with a degree of accuracy that has not been improved upon, indeed has never again been done so well.



ORIGINAL DRAWING BY ROKITANSKY FROM HIS LABORATORY NOTE BOOK.

In 1849 Rokitansky was appointed dean of the medical faculty and in 1850 rector of the University of Vienna. During this time he pointed out the needs of the university in several articles and administered with credit the affairs entrusted to him in these capacities. In 1852 he published his monograph on "Certain of the Most Important Diseases of the Arteries."[7] Except for the application of his theory of the crases his classification of arterial disease and aneurysms is still standard. The article consists of seventy-one pages (11 by 16) and is beautifully illustrated by sixty-one drawings and photographs, some of which are colored.

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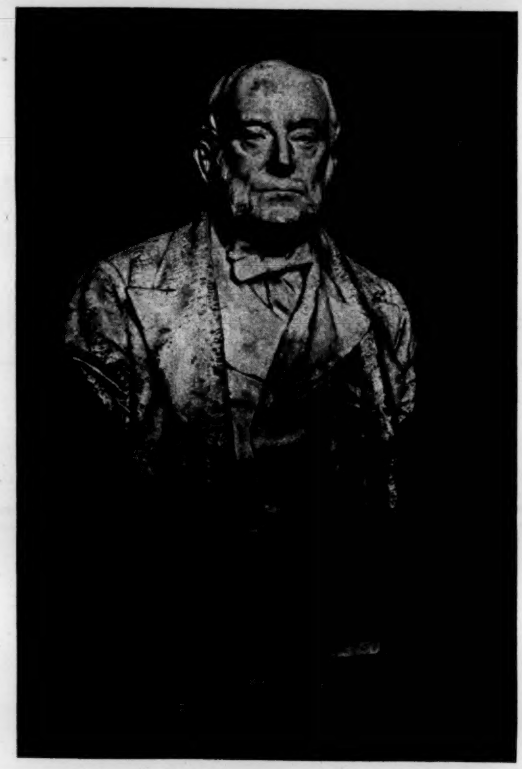
[6] Literararische Beiträge zur medizinischen Zeitung. No. 49, Dec., 1846.

[7] *Ztschr. d. Wein. Akad.*, 1852, LV, 1–72.

His post-mortem records were concise but sufficiently detailed in the important parts to suffice when they were utilized in his extensive research.



ROKITANSKY BUST IN INSTITUTE FOR MEDICAL HISTORY, VIENNA.

His laboratory note-book contained many original drawings that served to illustrate his conception of the things he saw grossly or microscopically.

After 1855 Rokitansky continued to produce with the vigor and enthusiasm of youth. Somewhat discouraged by his recent fight, he turned his efforts to the study of philosophy and comparative anatomy. Accordingly, in 1845 he published his monograph, "Concerning the Defects of the Septum of the Heart," on which he labored for fourteen years and which he studied from an embryological point of view. He then turned to the comparative anatomy of the urogenital tract, which engaged his attention until his death. In an editorial[8] written *in memoriam*, there are listed in chronological order thirty-three different publications, including his textbooks and monographs, as follows:

1. Handbook of Pathological Anatomy, 3 vols., 1841; 2 Revisions, 1855–1861.
2. The Conformity of the University with Regard to the Present Conditions of Austria.
3. Present Problems Which Concern the University with Special Relation to Medicine, 1863.
4. The Intrinsic Value of the Mind, 1867.
5. The Solidarity of All Animal Life, 1869.
6. Concerning the Anatomy of the Head.
7. Concerning Cysts.
8. Concerning the Most Important Diseases of the Arteries, 1852.
9. Concerning Shaggy(?) Cancer.
10. Concerning the Development of Cancer Structure with a Reflection on the Nature and Development of Other Meshworks.
11. Concerning Cancer of the Gall Bladder with a Consideration of the Benign Tumors of the Gall Tracts.
12. Concerning the Pathological New Growths of the Breast Glands and the Origin of Cysto-sarcoma.
13. Concerning the Outgrowth of Fibrous Connective Tissue Substance and the Significance of these to Inflammation.
14. Concerning Fibrous Connective Tissue Proliferation in the Nervous System.
15. Delineations (?) of the Pathological Anatomic Teaching Illustrations, 1831–1836.
16. Concerning Internal Intussusception.
17. Concerning the New Growths of Bone, on the Inner Table of the Skull in Pregnant Women.
18. Concerning Spontaneous Tears of the Aorta.
19. Concerning the Diverticulum-like Enlargements of the Trachea and Bronchi.
20. Concerning the So-called Double Uteru

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[8] *Med. Wchnschr.*, 1878.

21. Concerning the Combinations and Reciprocal Exclusion of Different Disease Processes after Observing the Body at Post Mortem.

22. Concerning the Stricture of the Intestinal Lumen and Other Occurrences Being Caused by Obstipation and Ileus.

23. Concerning Perforation of Gastric Ulcer.

24. Considerations of Spinal Curvature and Associated Breast Plate and Pelvic Delineations.

25. Lecture on the Characteristic Dyscrasia of Inflammation and Suppuration of Macerated Bones.

26. The Dysenteric Process in the Large Intestine and a Similar Process in the Uterus. Seen from an Anatomical Standpoint.

27. Sketch of the Size and Form of Liver Softenings.

28. Three Remarkable Instances of Diseases of the Pharynx and Oesophagus.

29. Observations and Additions Dealing with Fibrin Coagulation in the Heart Chambers, the Calcification of the Valves, and the Fatty Degeneration of the Myocardium.

30. Dissertations on the Knowledge of Bony Metaplasia (or Calcification).

31. Observations of a Pathologic Anatomical Nature.

32. Concerning the Dendritic Vegetations of the Synovial Membranes.

33. The Defects of the Septum of the Heart, 1875. 50 colored illustrations. His last work.

It will be noted that the works for which he is best known are not found among these. Garrison gives him credit for being the first (1) to detect bacteria in lesions of malignant endocarditis, (2) to differentiate between lobar and lobular pneumonia, (3) to distinguish between Bright's disease and amyloid degeneration, (4) to describe acute dilatation of the stomach. In addition he completed Laënnec's picture of emphysema by describing it microscopically. He also described spondylolisthetic deformities. Many other articles on non-scientific subjects were also written.

On February 19, 1874, on the occasion of his seventieth birthday, there was held a gigantic celebration[9] in honor of Rokitansky. The streets of Vienna reverberated with music and the songs of grateful students, in fact all Austria thrilled with quickened pulse as it paused in excitation to do honor to a world-famous native son who had lifted the science of medicine to a higher plane by the masterly strength of his fertile mind. In the banquet hall the nobility and Rokitansky's colleagues reviewed his life's activities in praiseworthy terms. In memory of this event he was presented with the following certificate of honor,[10] written in medieval Latin and translated as follows:

> Whom may the great and good God carefully watch over, Charles Rokitanski, a Bohemian, the glory of Austria, the honor of the University, a pupil of the celebrated school of medicine, who gave a new impulse to this school and greatly furthered it, who happily united the efficiency of the investigator with keen philosophical penetration, because of his immortal works on anatomic pathology, because of his rich learning, his example laudably stimulating rivalry, because of his clinic of anatomic pathology, renowned school of learning—most deserving of praise in his own lifetime as well as by succeeding ages, because of his love of country, zeal for freedom, because of his philanthropy distinguished and generous to every one, on this day, the twenty-second of February, 1874, which marks the happy completion of the seventieth year of his age, the Rector and the Senate of Vienna University heartily congratulate and wish health and prosperity for many years.

Much pride must have filled the bosom of the venerable "father Roki," as his students fondly called him. He received many honors other than the golden medal, "pro letteris et artibus," which was given him on the occasion already mentioned. In 1871 he was presented with the "Commander Cross and Star of Franz Joseph Ordens," and later that of the Leopold Ordens. Symbolic of national respect as these honors were, and much as he valued them, it was always evident that he treasured vastly more the eager solicitations of inquiring students who came from distant lands to share his knowledge. No other man before him or since has been the center of such great attraction.

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[9] *Wien. med. Presse*, 1874, p. 185.

[10] Translation by Rev. Father Lauerman.

Rokitansky was not completely submerged in his scientific studies. He had time to air his views on politics. Preaching the doctrine of freedom, here as he did in research, he favored the liberal party and through his zeal and standing became speaker of the house, where he served with distinction and influence.

In the latter years of his life the strain of his untiring application began to show. Although a sufferer from asthma he exhibited unusual stamina and fortitude in pursuing his labors at this advanced age.

He retired one evening apparently in good health. About four o'clock in the morning he awakened and complained of a general ill feeling which was followed by a severe heart cramp and sudden death. This occurred on July 23, 1878. He was survived by his wife and four sons. The two older sons became singers, while the two younger followed in the footsteps of their illustrious father, whose demise served only to remove a dynamic force from the center of accomplishments that were to live on and grow in value unmeasured.

Rokitansky made Vienna the center of medical learning. Bringing the speculative clinicians of the time to the autopsy table to learn the limitations of their skill was part of his mission. Staggering some in his various vicissitudes, he nevertheless held a straight course in the creation and delineation of anatomic truths in relationship to disease. By the performance of 30,000 autopsies (approximately 1800 annually up to March, 1866) viewed by many students from all over the world, he instilled a well-rooted fundamental basis for universal intelligent diagnosis and practice of medicine. His was probably the greatest single balancing force in medical science of the nineteenth century. In recent years it is becoming evident that clinicians are again drifting away from the first-hand knowledge of morbid anatomy. To them, the solidarity of the monumental, epoch-making, unchanging truths elicited by Rokitansky in another age should stand as a warning and a protest, a call back to the basic considerations to which this great man devoted his life.

THE POWDER OF SYMPATHY

By W. G. AITCHISON ROBERTSON, M.D., D.SC., F.R.C.P.E.
EDINBURGH, SCOTLAND

IN days now happily long gone by, many highly educated men believed that if a certain special powder were sprinkled in the garments stained by the blood from his wound, the injured person would be cured in a short time. Such a cure might result even though he and his garments were sundered far both in time and space.

Not only so, but if the powder were made into a salve and applied to the weapon which caused the wound, cure would follow. Sir Walter Scott refers to this in "The Lay of the Last Minstrel":

> But the broken lance in his bosom stood,
> And it was earthly steel and wood.
>
> She drew the splinter from the wound,
> And with a charm she stanched the blood;
> She had the gash be cleansed and bound;
> No longer by his couch she stood;
> But she has ta'en the broken lance
> And washed it from the clotted gore,
> And salved the splinter o'er and o'er.
>
> William of Deloraine, in trance,
> Whene'er she turned it round and round,
> Twisted as if she galled his wound.
> Then to her maiden she did say,
> That he should be whole man and sound,
> Within the course of a night and a day.
> Full long she toiled; for she did rue
> Mishap to friend so stout and true.
>
> Canto iii, 23.

Butler in Hudibras makes fun of this and says that he could cure warts and corns or fire a mine in China with sympathetic gunpowder.

What was the composition of so wonderful and miraculous a powder?

It is stated that this powder had its origin in the East, and that a monk who had sojourned there for many years brought to Europe the secret of its manufacture. Certainly the prescription has not much of an Eastern flavor about it, and one is inclined more to believe that it was evolved from the inner consciousness of some one who had all the attributes of a witch or sorcerer. It partakes of the characters of the "hell-broth" which these unfortunate individuals were said to concoct. At least Macbeth's witches sang as they worked:

> Round about the caldron go;
> In the poisoned entrails throw.
> Toad, that under the cold stone
> Days and nights hast thirty-one
> Swelter'd venom sleeping got,
> Boil these first in the charmed pot!

Then were added snake, eye of newt, toe of frog, wool of bat, tongue of dog, adder's fork and blind-worm's sting, lizard's leg, howlet's wing, scale of dragon, tooth of wolf, witches' mummy, shark, hemlock, Jew's liver, goats' gall, nose of Turk, Tartar's lips, finger of a child strangled at the birth, all cooled with a baboon's blood.

Though the powder of sympathy had perhaps fewer ingredients they were not a whit less repulsive.

Paracelsus in his "Archidosces Magica" (1526) gives his prescription for the sympathetic ointment. One had to take of moss which grew on the human skull which had been exposed to the weather for some time, and of human fat, of each two ounces; of mummy and human blood, of each half an ounce; of oil of roses and of bole armeniac of each one ounce; of linseed oil two drams; all to be made into an ointment. When a wound had to be treated, a splinter of wood had to be dipped into the blood of the wounded person; when the blood had dried on the wood it was placed in the ointment. The wound was to be bandaged every morning after a new cloth dipped in the patient's urine had been applied. In this way the wound would heal without any other application, and one could cure a patient ten or twenty miles away if only one had some of his blood. In the same way, if one anointed the weapon with which a person had been wounded a cure would result.

Jerome Cardan (1568) states that the ointment must contain twenty-six ingredients though he says many practitioners used much fewer. The fame of the powder or ointment spread to England and while we find several writers testifying to its curative power, others soon took up the pen to demonstrate and ridicule the idea of its efficacy.

Lord Bacon in Chapter x of his "Historia Naturalis" (1620) writes:

> It is constantly received and avouched, that the anointing of the weapon that maketh the wound, will heal the wound itself. In this experiment upon the relation of men of credit, though myself as yet am not fully inclined to believe it, you shall note the points following: *first*, the ointment wherewith this is done is made of divers ingredients; whereof the strangest and the hardest to come by, are the moss upon the skull of a dead man unburied, and the fats of a boar and a bear killed in the act of generation. These two last I could easily suspect to be prescribed as a starting-hole; that if the experiment proved not, it might be pretended that the beasts were not killed in the due time; for as for the moss, it is certain there is great quantity of it in Ireland upon slain bodies laid in heaps unburied . . . The description of the whole ointment is to be found in the chemical dispensatory of *Crollius*. *Secondly*, the same kind of ointment, applied to the hurt itself worketh not the effect, but only applied to the weapon. *Thirdly*, which I like well, they do not observe the confecting of the ointment under any certain constellation, which commonly is the excuse of magical medicines when they fail, that they were not made under a fit figure of heaven. *Fourthly*, it may be applied to the weapon, though the party hurt be at a great distance. *Fifthly*, it seemeth the imagination of the party to be cured is not needful to concur, for it may be done without the knowledge of the party wounded; and thus much has been tried, that the ointment for experiment's sake, hath been wiped off the weapon without the knowledge of the party hurt, and presently the party hurt has been in great rage of pain, till the weapon was re-anointed. *Sixthly*, it is affirmed, that if you cannot get the weapon, yet if you put an instrument of iron or wood resembling the weapon, into the wound whereby it bleedeth, the anointing of that instrument will serve and work the effect. This I doubt should be a device to keep this strange form of cure in request and use, because many times you can't come by the weapon itself.
>
> *Seventhly*, the wound must be at first washed clean with white wine or the party's own water, and then bound up close in fine linen, and no more dressing renewed until it be whole.
>
> *Eighthly*, the sword itself must be wrapped up close, so far as the ointment goeth, that it taketh no wind.
>
> *Ninthly*, the ointment if you wipe it off the sword and keep it, will serve again and rather increase in virtue than diminish. *Tenthly* it will cure in far shorter time than ointments of wounds commonly do. Lastly, it will cure a beast as well as a man, which I like best of all the rest, because it subjecteth the matter to an easy trial.

Another who firmly believed in the power of the powder of sympathy was Dr. Nathaniel Highmore whose name is familiar to students of anatomy for the cavity in the upper maxilla that bears his name. He was born in 1613, studied medicine and took his degree at Oxford in 1642. It was here that he met Harvey, and to him Highmore dedicated his first work entitled, "Corporis humani disquisitio anatomica in qua sanguinis circulationem prosequitus est." He wrote several other works, but it is his "History of Generation, etc. to which is joyned a *Discourse of the Cure of Wounds by Sympathy*, or without any real applycation of medicines to the part affected, but especially by that Powder, known chiefly by the name of Sir Gilbert Talbot's Powder," published in 1651, to which I wish to draw attention. It is an interesting work as showing the laborious and involved line of reasoning common at this period. The book was dedicated to the famous philosopher, Robert Boyle.

He remarks that "the sympathetic cure of wounds will soon appear as an unquestionable truth and not as a magical delusion as hath been supposed, because":

1. All actions and motions are performed by Atomes moving after a different manner;

2. There is a constant Effluvium or expiration of such Atomes from all bodies . . . causing them to wander about in the air till they meet some other body of the same nature, or return to the original body where they may obtain their desired rest for a time;

3. This expiration some by the help of glasses have seen in the form of a mist to flow from a Loadstone and other bodies whose Aporcheas are more plentiful. In bodies that are actually hot this effluvium is sensibly apparent to the smell, and are as sure a guide to the persecuting Dog;

4. These Atomes are not of one magnitude or grossenesse, some being so subtile and slender, that they admit of no opposition, but continue their course through all mediums. Such are the Contagious Atomes of bodies infected with the Plague or other pestelential diseases which are conveighed to remote places and persons on whom they exercise their tyranny. Others again are grosser and cannot so easily passe by and are therefore driven and inforc'd from their intended voyage;

5. It is a general law of nature that all bodies desire rest;

6. There are some places more fit for receiving and holding of Atomes than others. Some Atomes are Angular, some Cylindrical, branch'd, smooth, sharp, rough. There are in bodies pores agreeable to these figures, so that some Atomes shall bee received into pores proportional to them. The infectious Atomes of that pestilential disease among beasts, called the *Murren*, insinuate themselves into Cows and Swine, not into Horses or Men, as the infection of the Pox or Measils in Men is not communicated to Beasts. This agreement betwixt the pores and the Atomes, makes that we call *Cognation;*

7. No atomes rest anywhere but in those cognate or proportionate pores. If not cognate they are shouldered on by Atomes which suit more conformably to the pores and so are inforc'd to move where there is least crowding, and where the violence least urgeth. This motion they say is caused by *Sympathy;*

8. No distance hinders the motion of these Atomes toward their natural places. This sympathetic motion of these Curative Atomes cannot be accounted Magical, if they cure the part they seem not to touch;

9. The nearer these Atomes approach to their desired home, the resistance is still lesser on that side, and the pressure greater on the contrary;

10. There may be and oftentimes is a Conjunction of Atomes, which in their Pilgrimage, flie on the back one of another, and may and do operate together.

These things premised will demonstratively illustrate the cure of wounds without any topical application. We will explain the manner, the medicine, and why it works.

The Medicine is made of a Zaphyrian Salt, calcined by a celestial fire, operating in Leo and Cancer, into a Lunar complexion. It must be kept constantly dry. If the heat be excessive, all the volatile parts and finest atomes, which onely work this cure, will be evaporated, and only the grosser saline part remain, which by their sharper angles, grate the orifices of the capillary veins and so produce an efflux of blood, and not a consolidation of the wound.

The substance of this being joyned with other unctuous bodies is applyed to the wounds themselves in most cicatrizing and drying emplasters as is that called Diapalma, &c; Much more effectual must the finer active volatile particles be when conveighed into the remotest pores of the wounded part by the help of the bloody atomes returning home; upon whose score they finde a far greater and more welcome entertainment than if they came alone, or joyned with any other Forainers.

The Manner of Applying It. The blood or bloody matter taken from the wound or a cloath, must be lightly covered with this powder, kept very dry, and afterwards wrapt up close from the air, and so kept at a temperate heat; the wound in the meantime must be kept clean, and clothed up with dry clean clothes. If the wound be fresh, the applied medicine presently stoppeth the blood and hinders an afflux of humors to the part.

The way which these balsamical atomes of the medicine, applyed to the blood, take to come to the wounded part is next to be showed. It must need make this cure suspected, because the Medicine being applyed only to the blood, there appears to be no kinde of contact and therefore no operation or action upon the wound.

But the Sun darts his beams into any inferiour body though thousands of miles remote from it. The Medicine therefore being a body constituted of several particles, there will necessarily be an Effluvium or constant expiration of atomes from it, and by the ninth rule these may be conjoyned with the atomes of blood extravenated, and accompany them in their flight. Nay, they must joyn with them, and the particles of the salt will be carried by the particles of the blood. Who by the sixth and seventh rules must by necessity be driven to the wounded part, though remote from it a very great distance.

When these companions, the atomes of the extravenated blood and the medicine, are come to the wounded part, the atomes of the blood are received, finding an easie entrance at those cognate parts, those proportionate pores, with which covertly slips in the other of the medicine, who meeting there with more moisture, presently delivers up its saline parts to be conjoyned with those new moist parts which are loose and fitter to be driven out, which is suddenly done. The medicine hath such parts also as contracts the solider parts neerer together and so shuts the orifices of the veins, that the efflux of blood and humors thence is presently stayed, so that the wound is more easily soadred up.

This double work of the Medicine, the loosening and diluting the fluid parts that distend the pores of the wound (which causes the pain) as likewise the constriction of the pores, is demonstrable in all salts.

The cloth in which the blood and Medicine are kept, must be wrapt up close and kept warm in a temperate heat, not declining to either excesse. First because the cold doth prohibit the expiration and breathing forth of these Atomes which should drein forth the superfluous humidity. And this is that which causeth the pain, occasioned by exposing the clothes to the cold air. Besides this hindring the efflux of those aporrheas from the cruentated cloth by cold, there may bee some extraneous atomes (as those of cold or icy parts, which being conveighed along with those atomes from the cloth, may disaffect the wound, as may appear by that story of Sir Kenelm Digbye's usage of Master Howels cruentated garter, heating it over coals in a dish of Vinegar, which put the lame gentleman into extream pain and torture, but upon the removal of those and the fresh dressing of the garter, hee presently received ease and in a short time a perfect cure). The other extream, viz. of heat, doth as much exasperate the wounded part, as is shown by a similar case to the above in which the cloth was accidentally kept at a great heat. This raised a far greater number of saline parts than usually and which did when introduced into the wound by the sanguineous atomes by their sharp angular parts shave and corrode the orifices of the veins.

This cure by this Atomicall Energy wrought at a distance is more sudden than any the most excellent Balsame could perform or than the substance of the Medicine it self applyed to the part could do.

Thus have I cleared what to Philosophers seemed one of Nature's Cabbinet-secrets, but to others it hath been accused to have been done by some diabolical compact.

The famous philosopher and writer on most varied subjects, Sir Kenelm Digby, is the man whose name is, however, most usually associated with the powder of sympathy. Though we cannot believe that he was its originator, he did more than any other, not only from his own observations but perhaps more from his social standing, to make the preparation widely known. He gave grounds for his belief in it in "A late Discourse made in a solemne Assembly of Nobles and Learned Men at Montpelier in France by Sir Kenelm Digby, Knight, etc. Touching the Cure of Wounds by the Powder of Sympathy, with instructions how to make the said powders, whereby many other secrets of Nature are unfolded. Rendered faithfully out of French into English by R. White, Gent. 1658."

He narrates the case of W. Howell; a case which was investigated by King James I of England and also by his son, the late King Charles, and the Duke of Buckingham, then Prime Minister. Mr. Howell in an endeavor to separate two duellists, got his right hand cut to the bone and also received a severe wound on his head.

He came to my house four or five days afterwards saying that his surgeons were afraid he would lose his hand from gangrene. I asked him

> to give me anything which had the blood upon it, so he gave me his garter with which it had been bound. I took a handfull of Powder of Vitriol and dissolved it. I put the bloody garter in it and observed Mr. Howell, who was talking with a gentleman in a corner of my chamber not regarding what I was doing; but he started suddenly, as if he had found some strange alteration in himself. I asked him what he ailed? I know not what ails me, but I find that I feel no more pain, methinks that a pleasing kind of freshnesse, as it were a wet cold napkin, did spread over my hand, which hath taken away the inflammation that tormented me before. I replied that I advise you to cast away all your playsters, only keep the wound clean, and in a moderate temper. This was shortly after reported to the King and to the Duke of Buckingham, who were curious to know the circumstance. After dinner I took the garter out of the Water and put it to dry before a great fire. It was scarce dry, but Mr. Howell's servant came running, that his master felt as much burning as ever, if not more, for the heat was such as if his hand were twixt coles of fire. I answered that he would find ease in a short time, for I knew the reason. At the instant he went, I put again the Garter into the water, whereupon he found his master without any pain at all. Within 5 or 6 days the wounds were healed. King James required a punctual information of what had passed touching the cure. His Majesty would needs know of me how it was done, having drolled with me first about a magitian and a sorcerer. He then would do it with his own hands, therefore he would have some of the powder, which I delivered, instructing him in all the circumstances. Whereupon His Majesty made sundry proofs, whence he received singular satisfaction. The secret has now fallen into my hands, and now there is scarce any country Barber but knows it.
>
> It must be avowed that it is a marveilous thing, that the hurt of a wounded person, should be cured by the application of a remedy put to a rag or cloth, or a weapon at a great distance. The true causes have hitherto been wrapped up in darknesse. I wish now to make convincing proofs, that this Sympathetical cure may be done naturally and to show you how it may be done.

Sir Kenelm now enters into a long involved philosophical discussion as to the reflection of "rayes" of light, and shows how these reflections carry part of the substance on which they have impinged. Interspersed with this argument is a narrative of his shipwreck.

He shows how one can wash his hands in a "dry silver basin by the reflection of the moon beams":

> One would think it were a folly that one should offer to wash his hands in a well-polished silver basin, wherein there is not a drop of water; yet this may be done by the reflection of the moonbeams only, which will afford it competent humidity to do it, but they who have tried it, have found their hands, after they are wiped, to be much moister than usually; but this is an infallible way to take away warts from the hands, if it be often used.
>
> They who have been pricked by a Viper or Scorpion hold over the place, the head of a Viper or Scorpion bruised and by this means the poyson returns back from its way to the heart of the person bitten and so leaves the party well recovered. In time of common contagion, they use to carry about the powder of a toad or a living toad or spider shut up in a box or arsenick which draws into it the contagious air. Farcy is a venomous humour in a horse, if a toad be hanged about its neck in a little bag, the horse will be cured infallibly; the toad which is the stronger poyson drawing to it the venome which was within the horse . . . Touching the sight, 'tis Evident that the light reflecting upon the body it sees enters into the eyes bringing with it some emanations of the body whereon it reflects and so explains the formation of mothers marks.

The author goes on to explain and illustrate by cases the nature of maternal impressions. He describes (somewhat incoherently) the manufacture of the sympathetic powder and states that it is a kind of vitriol. It was highly efficacious in "stanching of desperate bleeding at the nose, in stanching the blood of a wound and in curing any given wound (where there is no fracture of bones) without any plaister or oyntment in a few days." In the case of an incised wound the powder was infused in water and "into this water they did put a clout or rag of cloth embrued with the blood of the party hurt (the rag being first dry) but if it was fresh and moist with the reaking blood, there was no need but to powder it with the small powder of the said vitriol." Further on he explains that "the same cure is performed by applying the remedy to the blade of a sword which hath wounded a person" but first the wound itself had to be washed clean, the edges brought together and the part bandaged. "As the sword is treated, the wound inflicted by it feels. If the sword be kept wet, the wound will feel moist and cool; if it be held to the fire, the wound will feel hot."

In another work by the same learned writer, "Choice and Experimented Receipts in Physick and Chirurgery" published in 1668, Digby gives the following sympathetic cure for toothache:

> With an iron nail raise and cut the gum from about the teeth till it bleed and that some of the blood stick upon the nail; then drive it into a woodon beam up to the head; after this is done you never shall have the tooth-ach in all your life.

In spite, however, of the high authority of Sir Kenelm, there must have sprung up much opposition to belief in the efficacy of this powder. As early as 1651 we find the celebrated Dr. James Primrose ridiculing the employment of this agent. Of the weapon salve he writes in his "Popular Errours:"

> Because the Weapon salve, otherwise called the sympatheticall, magneticall and starry oyntment, is held in so great esteeme by some, that they think it cures woundes, being applyed not to the affected part, but to the weapon that makes the wound, we will not pass it over, for now adayes it begins to be much in use. This was the invention of some Germanes, especially of Theophrastus Paracelsus and others. Now some will have this to bee a wonderfull gift of God, that wounds should be cured with so much facility, so that for the future surgery need not be regarded seeing wounds and ulcers may be cured with one only remedy. Yet Nature seems blameworthy in that shee so long kept close such an excellent remedy and revealed it not to Adam, the Patriarchs, holy men, Jewes, the primitive Christians and the most learned men, but hath revealed it to drunkards, whoremongers, dicers, such as the report goes Paracelsus was. Goelenius says that he could name Emperours, Kings and Princes who give testimony to the vertue of this oyntment, but I verily believe that Goelenius was never known to Kings and Emperors.
>
> This oyntment is compounded of mosse that grows upon a man's skull, because this is, as it were, the pure quintessence of the skull and a spirituous substance.
>
> Crollius makes choice of a man that hath dyed a violent death, and Hartmann preferres one that hath been hanged, "Because when they are strangled, the naturall and vital spirits are carried upwards and as they cannot get out of the hard skull they are coarcted together with the animal spirits and in processe of time grow into one and breake forth into the circumference of the skull." Hartmann however is a grosse and palpable errour, for how knows hee that those spirits are carried up to the braine in them that are hanged. How then can these spirits be present when the corpse is rotten and the skull bare and fit to contract mossinesse. Besides the substance of spirits is very thin and apt to evaporate; how is it then that they grow into a grosse and filthy mosse.
>
> Of this mosse Crollius mixes in his oyntment but the weight of two hazell nuts or one dramme, but Paracelsus deemed two ounces little enough, but added the blood and fat of a man. Both add thereunto mummy (Hartmann thinks Egyptian mummy). Which nevertheless is the most unprofitable remedy, being made in Egypt by cousening fellowes of the flesh of Elephantick and leprous persons and of such as dyed of the French Pox or some such filthy diseases and of the flesh of slaves which they buy and which they Enbalme with Pitch and Bitumen. But Paracelsus doth highly extoll *Mummie* of the *gallowes* or the flesh of a man that was hanged together with oyle of Roses and linseed. Crollius added earth-wormes washes, the braine of a bore, redde sanders and the blood-stone. Some in the making up the oyntment observe the aspect and course of the stars. Others doe annoint the weapon and binde it up carefully and keep it warm and free from dust and winde, otherwise the partie wounded will be in greivous

torture, if the weapon should lye cold and unbound. If the weapon that made the wound cannot be had, they take a piece of wood, especially willow, and besmeare it over with bloud that flowes from the wounds and so apply the remedy unto it. They also bid that the wound be washed every day with urine. Some give this reason of the effect, to wit, that there are spirits in the bloud, and in regard to the familiaritie and sympathy of mans spirits among themselves, the oyntment is made of mans bloud, fat and flesh and the mosse of the skull in which spirits are contained. Thus when the bloud, of the party wounded is joyned unto the oyntment, the spirits that are in the bloud, are by reason of sympathy joyned with the spirits of the oyntment and so doth take the vertues of the oyntment and carry it unto the partie wounded. Crollius thinks them all fooles who think that this cure is Magicall and he will have it to be done by a Magneticall and attractive vertue caused by the starres. And Hartmann explaines it, when the weapon is anoynted, the salt of the blood which is upon the weapon doth by a magneticall vertue draw the animal spirits out of the oyntment, which two spirits by the concurrence of the spirit of the World are friendly united into one. Thence it is that the partie is in paine if the weapon bee held to the fire or exposed to the colde aire, and contrariwise if the patient eat onions, mustard or garlick, it may presently be perceived in the weapon, because those spirits doe communicate their passions one to another.

Our author discourses learnedly to show the falsity of the reasoning of those who believe in the ointment and says that only such wounds have been healed which might have been healed by nature's endeavour alone. He asserts that it is a false statement to say that this ointment is a more special gift of God than are other ointments and remedies, and that it is an unprofitable manner of making a cure.

They say that from the too loose or too strait binding of the weapon the same symptoms doe happen in the sick. Now these symptomes doe proceed either from the oyntment or from the binding. As if the weapon should bee anoynted in a Northern country, and the patient be in Afrik in a hot country; Suppose the weapon to bee colde, the patient likewise will be cold in Afrik. Yea perhaps being near the fire. Now seeing that cannot be done but by the aire, the aire of the Northerne Country shall have power to refrigerate the aire in Afrik which is a grosse absurditie.

It is impossible to follow Dr. Primrose through the long course of his destructive criticism, but suffice it to say that he is no believer in the efficacy of the power of the sympathetic powder.

CRAWFORD WILLIAMSON LONG

By FRANCES LONG TAYLOR

ATHENS, GEORGIA

Part II (*Conclusion*)

In December, 1849, appeared the first publication of the Georgian's discovery. The reasons for his delay have been given in preceding paragraphs. He had long desired a wider field for the practice of his profession, and with his little family and faithful negro servants moved to Atlanta, where he remained one year. He soon had a flourishing practice, and made investments in what is now the business section of the city. On a square across from the Piedmont Hotel stood, until recent years, the two-story brick house he built for a home.

At the time of my father's removal, 1851, it had always been the custom in the South for the young physician to have in connection with his office what was called his drug shop, where he rolled his pills, weighed his powders, and compounded his own prescriptions. As his practice and fortunes increased he generally invested in a drug store. My father followed the usual custom, and with his brother, Dr. H. R. J. Long, bought the business of two physicians and pharmacists in Athens who wished to retire, and established what was known for many years as "the largest wholesale and retail drug house in Northeast Georgia." In the rear of the building was the private office. Later in life my father became the owner with his son as junior partner and manager, his practice being so exacting he had but little time for anything else.

Says one of his old clerks: "He was quiet, unassuming, gentle and gracious in manner, but was exacting and particular in business dealings and required order, system, and cleanliness in all the appointments of store and office. He was of a sociable disposition, which attracted many friends who enjoyed his quiet pleasantries and good humor." He had so much refinement and delicacy of feeling that no one ventured to use an oath or an obscene word before him.

As was the custom in the South, his home had spacious grounds, where grew children, flowers, fruit and vegetables, a large grove under whose shade the children played, a pasture in which the cows grazed, a stream where the horses including the ponies for the children of the family were watered. Sometimes the stable man allowed us to ride the large horses, which we did without saddle or bridle at breakneck speed. The following lines as depicted in my mother's journal, written in 1886, give a glimpse of the home life about this time (1859).

> We had prospered in this world's goods, had a lovely home, and sweet, pleasant children, two sons and three daughters. My husband was the leading physician, fine looking, a devoted husband and father, a kind, judicious master, beloved and respected by all classes. Our home was a paradise where our "olive plants" throve apace. A large and lucrative practice enabled us to live handsomely, without entrenching on other sources of revenue. Our olive plants became more numerous, but it mattered not—we had a welcome for all. They made us very happy.

A large plantation was bought and negroes, most of them inherited, were placed upon it. They did not support themselves by their labor, but their natural increase made them valuable had he chosen to have sold them, which he never did with one exception, a man who was a confirmed rogue.

The following letter will show his solicitude for his servants. He often said he thought that the Providence of God had permitted slavery in order to Christianize the African race, and regarded his slaves as a sacred trust. He closes a prayer written in his journal thus: "May I be a more considerate husband, a more tender father, and a better master."

New York, April 26, 1854.

Mrs. C. W. Long,

Dear Caroline: You can scarcely realize how anxious I have been for several days to hear from you. I feared something was wrong, which prevented you from writing. Your letter of the 16th was not received until this morning, and how sad it makes me feel that you have been sick and had such trials and troubles. How much I wish I could be with you to comfort and cheer you, if still sick, and as well to lighten your other trials.

How sorry I am to hear of poor Melvina's[1] sickness and derangement. Mr. Terry arrived here yesterday morning and told me there was something the matter with a negro girl of mine. I supposed it was another attack of jaundice, but did not think it would last long. This made me uneasy, but I felt much worse when I learned from your letter what a desperate condition Melvina is in. How dreadful it would be for her to become a confirmed maniac. I do hope she will recover both from her mental and bodily disease. Restless and uneasy as I am, yours must be a severer trial than mine—you sick, our dear children sick, and then the other trials added. I do hope that the good and great God who has been so kind and gracious hitherto will preserve and protect you in all your trials and afflictions and make these trials a blessing to us. They are sent for some wise and good purpose. May we see their intent and profit by them.

I hope very much that Melvina's mental affliction is produced by some disease of the body, which can be relieved and that I may find her recovered when I once more reach our humble, but to me sweet home, and once more clasp in my arms your dear form and receive the embraces of our sweet children. Home never felt so sweet to me before nor did I ever realize before how dear were these loved ones, who, I trust, are now well and happy in that little home.

I shall hurry through my business as quickly as possible and, if God preserves and protects us all, we will soon meet again, and once more be happy in each other's society.

I have never enjoyed a trip less than the present, and although I wrote as cheerfully as possible from Columbia, I had sad forebodings which I would not express. I trust that the cause of my forebodings has passed away.

Jones wrote me on the 18th, but said nothing in regard to your health and Melvina's condition.

Yesterday morning I went to Trinity Church and heard a good sermon. In the afternoon, some company came around to the hotel and invited us to walk out and see the city. We spent about three hours walking; visited the mission house and then Five Points, and saw the efforts to reform that "sink of iniquity." They pronounce that part of the city reformed, but it is now the most wretched looking place I ever saw. The missionary effort is greatly blest and with perserverance they will reform that part of the city.

I have not time to write more, but will give you an account on the sights when I once more enjoy the pleasure of being with the dearest and best of wives.

Your husband,

(Signed) C. W. Long.

In this letter no mention is made of any pecuniary loss resulting from the unfortunate condition of his slave, only great sympathy for her physical and mental affliction.

That many agreed with his views that slavery was God's method of civilizing and Christianizing the negro was proved by the efforts of the better class of the South to subject them to religious influences. They were made to marry, Sunday schools were taught by the white matrons and their daughters trained the youth.

The superintendent of the negro Sunday-school in Athens was one of our most eloquent lawyers, Thomas R. R. Cobb, author of a book on slavery, and who later became a Confederate general. He was killed at the battle of Fredericksburg.

Many of the slaves were members of the churches attended by their owners, the galleries being reserved for their use. Communion was administered to them by the officers of the church, and when the hour for evening prayer in the home arrived a bell was rung as a signal to the house servants, who after their entrance ranged themselves against the wall, listened to the reading of the Bible, and reverently knelt during the prayer offered by the master or the mistress.

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[1] Melvina was a slave domestic.

The usual routine of life went on with its everyday duties fulfilled and its simple pleasures enjoyed, until the fateful days of the sixties. My father's business had prospered and by inheritance and from his own labor he had amassed what was then considered a fortune. He was gradually relinquishing his profession, for having attained to the age of forty-six years, he longed for more time for reading and study. He was reared in a literary atmosphere, his father possessing a wonderful collection of old books. With leisure he could also travel abroad, something he greatly desired to do.

John Brown's raid and Lincoln's election threw the South into a turmoil and soon the secession of South Carolina took place. Although too young to realize the seriousness of the condition of affairs, I recall the impressions of a visit in the spring of 1861, made by Ex-Governor Swain of North Carolina, my mother's uncle, who was returning from Charleston after attending a meeting of delegates from the Southern States in that city to discuss the wisest course for the South to pursue. He and my father deplored secession, feeling that the Republican president should have been tested before trying so serious a thing as dissolving the Union. They had ardently supported Mr. Stephens' great and tireless efforts to prevent the movement for Georgia's withdrawal and to adjust all differences between the sections, but when Georgia seceded, my father went with his state and supported the cause of the South heart and soul. When the news came of Georgia's decision the young men of Athens celebrated that event with a torchlight procession. The flaring torches and the band of music fascinated us children of the family and we begged that we be permitted to go on the street and see it. To our surprise my father refused the request, declaring: "It is the saddest sight of my life." He paced the room for hours, realizing the inevitable result of war between the states. It has been said that the only political speech he ever made was against secession.

After the fall of Sumter, the younger men in their gray uniforms marched away to the various scenes of action leaving the middle aged and old men, but before the four years of strife was over, there remained only the very old of these men and lads under sixteen, with the exception of those appointed for special duties. Among these was my father, who without solicitation had been designated to remain at home as physician for the families of the soldiers, and for the wounded who had been sent home to recuperate.

A memorial of this service has been presented to his family in the form of a Cross of Honor from the Georgia Division of the Daughters of the Confederacy, Laura Rutherford Chapter, Athens, Georgia, No. 1912, with record in their minutes as follows:

> To Crawford W. Long who rendered very material aid to the Confederate Cause in various ways. Dr. Long was appointed by the Confederate Government as physician at Athens, Georgia; for the families of soldiers absent from home fighting for the Confederate Cause, and was relieved from active service for this, and to act as surgeon for sick and wounded soldiers at the University Campus Hospital.
>
> (Signed)
>
> Thos. Bailey. White's Reg. 55th. Ga. Vols.
> H. R. Palmer. Co. K. Cooks Btn.
> W. G. Carithers. Adj. Camp 478.
> W. G. Morton. A.D.C. Cobb Deloney.

He was one of the owners of the largest drug house in northeast Georgia and, realizing that when all ports would be blockaded great suffering must result from a dearth of medical and surgical supplies, he ordered a large consignment which reached Savannah at the outbreak of the war. They were paid for twice, first to the Confederate Government (which seized the cargo as contraband) and again after the close of the war, after years of privation and toil, both principal and interest were paid to the firms in the North from which they had been purchased.

His forethought in supplying himself with medicines, especially ether, chloroform, carbolic acid and iodine, saved many lives as government supplies were very scant. Iodine, which was universally used by Southern surgeons in treating wounds, was practically abandoned by the profession as a disinfectant until the recent World War, when its virtues were again recognized and the soldiers of the Allies were supplied with it and taught to apply it. In an issue of the London *Lancet* published about 1915, was a most interesting article on "The Treatment of Gun-Shot Wounds by Iodine by Southern Surgeons during the Civil War, and the Resumption of Its Use."

Every day life grew harder. New Orleans and Vicksburg had fallen, our little town was crowded with refugees. The necessities of the soldiers must be attended to first. The absolute destitution of the comforts of life (except our well-furnished homes and splendidly trained servants) made it necessary to exert every effort to support life. All enterprises were at a standstill with the exception of cloth and grist mills. There was a year when the wheat crop failed, and the poor lived entirely upon corn bread. We were so fortunate as to have wheat bread once a day, but the greater part of the wheat raised on our plantation had been requisitioned by the government, for the army must be fed. Corn meal cooked in its various forms was passed with the old time ceremony by the dining room servants. I can never forget the howl of rage my little brother would give when he saw the contents of the plate: "Old corn dodgers," he would cry with the tears streaming down his cheeks.

Southern women became wonderfully resourceful in devising ways by which to alleviate their lot. Old garments were turned and dyed; even handsome damask curtains that once ornamented drawing rooms were made into dresses for the young girls; hats were woven of palmetto; ladies' bonnets were ornamented with really beautiful flowers made of feathers skillfully tinted. No longer were dainty slippers worn, but rough shoes. They were particularly prized when enough cloth could be found to make their uppers. Persimmon seeds were used as buttons and thorns for hairpins. Equal ingenuity was displayed in concocting palatable drinks and food from unpromising materials. Sliced dried and parched sweet potatoes, roasted rye and wheat were substituted for coffee, sorghum for sugar, sassafras and raspberry leaves for tea. A neighbor's butler brought with his mistress' compliments at breakfast time, one morning, a handsome silver coffee pot containing a new discovery highly recommended, a simulated coffee brewed from dried parched okra. (Not a drink fit for the gods, said one profane soul, but "hell's broth.") To such straits we were reduced, that cakes were made from sorghum, unspiced and unflavored, but delectable to us, fruit cake from dried fruits, blackberries being considered particularly fine for this purpose. Wines were made from grapes, berries and tomatoes. Corn beer was greatly enjoyed and a beer made from persimmons and locusts was unrivaled. The small stores of foreign wines and liquors were buried or hidden in secret places by their owners. Owing to the high price and scarcity of medicines, herbs and decoctions from roots and barks were in great vogue. The dirt from smoke houses used in those days for curing meats was leached for salt. Confederate money was rapidly becoming worthless, and farmers exchanged their products for other commodities, nails, leather and factory thread being considered by them as particularly desirable. There was no longer oil for the lamps but candles, moulded from tallow, and dips, as they were called, which were made of a large round wick dipped in a composition of hot tallow and wax and wound around a corn cob. The finest of all lights was that of a pine torch by which many times, prone on the floor, face downward, body supported by my elbows I have studied school lessons and pored over old books and magazines long out of date. What joy to get a new publication which in some way had run the blockade, perhaps a volume of Dickens or "Les Miserables," which to the untutored mind was known as Lee's Miserables, and which was until read supposed to be a recital of the suffering soldiers.

My mother, like all the Southern women, sewed and knitted, meeting with other friends weekly to make lint and bandages for the wounded soldiers. Her seamstress was kept busy fashioning clothes for these men. The most difficult thing the women had to do was to finance the family exchequer, the "family" including the servants.

My father's duties were so exacting that my mother like many other women dispensed food, clothing and medicine for a large family of dependents whose claims absorbed her waking hours. She learned the arts of weaving and spinning from those few women living in remote country districts who had never given up this industry, and who were glad to instruct those whom they had considered "lilies of the field." The intricacies of weaving are thus described in Ovid's "Metamorphoses":

> The piece prepare
> And order every slender thread with care,
> The web enwraps the beam, the reed divides,
> While through the widening space the shuttle glides,
> Which their swift hands receive, then poised with lead
> The swinging weight strikes close the inserted thread.

She trained several negro women who from that time did nothing but weave cotton cloth for summer and woolen for the winter clothing of the servants (for they were never called slaves). She supervised the cutting and making of the garments and the knitting of socks and stockings.

When the time came for the syrup to be made, the hogs to be killed and the meat and lard put away, it was she who filled the overseer's place in this duty. White overseers had long been superseded by the trusted negro foremen. The position of mistress must have unconsciously fitted her for a dominant position, for her authority was never questioned. She was only one of many. My mother spent weeks at our plantation with us, her children, my father coming up for brief visits. Her faithful carriage driver often slept outside her door for protection.

My father regarded slavery as "God's method of civilizing the negro," the possession of his servants as a trust to be administered as a divinely imposed duty. This view was universal among the better class. It may be interesting to know that there were many, and it is even claimed more, slave holders in the Northern army than in the Southern, proving Mr. Stephens affirmation that the contest which ended in the war was indeed a contest between opposing principles, but not such as bore upon the policy or impolicy of African subordination. "They were principles deeply underlying all considerations of that sort. They involved the very nature and organic structure of the Government itself. The conflict on this question of slavery in the Federal Councils from the beginning was not a contest between the advocates or opponents of that peculiar institution, but a contest, as stated before, between the supporters of a strictly Federative Government on the one side and a thoroughly National one on the other."

One summer morning in 1864, news came that General Stoneman, commanding a division of Federal cavalry, was nearing Athens with orders from General Sherman to burn all the towns and cities that lay in his path, take all the mules and horses from the farmers, destroy all provisions and to decoy away all the negroes both male and female. A wounded young captain on horseback, with his crutches, dashed to our door bearing the message from my father to my mother that the carriage must be packed with the silver and other valuables, and that I was to accompany them under the escort of the captain to his father's plantation home which, being away from the main road, was considered safe from any raiding party. The trusted coach-

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[2] Stephens, The War between the States.

man, Humphrey, was hiding the horses in a swamp a few miles back of the town, so it devolved upon my little brother to act as driver.

Just before starting upon our flight my father came in hurriedly bearing a glass jar containing among other things two old-fashioned and very large gold watches. The larger of them my grandfather had worn for many years, the other was made by a famous watchmaker of Liverpool who was largely patronized by Georgians in the first half of the nineteenth century, and to whom my grandfather had sent gold from mines near Dahlonega, Georgia, in which he was interested, to be converted into four watches, one for each of his children. Later the mate to my father's was snatched from the pocket of my uncle by a Federal soldier, and never recovered.

In this jar was a roll of papers securely tied, which, my father said, "are most important and under no circumstances must be lost, they are the proofs of my discovery of ether anesthesia. Promise me that when you reach your destination you will bury them in a secluded spot, but if overtaken by the raiders, you may be frightened into giving them the jar if ordered to do so." This speech put me on my mettle, and I replied: "I will die before I do."

When we reached the plantation home I found the room I was to occupy nearly filled with trunks in which silver and valuables were stored, sent to what was considered a place of security. The captain's sister, whose husband was in the army, after learning my errand made the arrangements for me to carry out my purpose. My short dress was lengthened to the ankles, the jar suspended by a strong cord was tied underneath around my waist. With arms akimbo, I skipped gaily along apparently for an afternoon walk, but the dangling jar played havoc with my knees. An ugly black old negro man furtively watched us until we were out of sight. How my heart beat with fright until he disappeared. We felt we had disarmed suspicion by our carefree manner, and after finding an appropriate place the young woman drew out a concealed trowel, dug a hole, buried the jar and covered the place with leaves and sticks. The next day the news came that the raiders had been captured by Col. W. K. P. Breckenridge about twenty miles from Athens at a little place called Jug Tavern, now known as Winder.

Some years ago the ladies of that town on Memorial Day took up the remains of a Federal soldier on the battle ground, and reinterred the body with honors in the cemetery. A large number participated in this ceremony. The other bodies had been taken up by the Government and buried in a National cemetery, but for some reason this body was overlooked. The grave is regularly decorated, with those of the Confederate dead. Unfortunately, the name of the Federal soldier was unknown.

Our great adventure terminated happily, the jar was resurrected and my brother and I returned home. After that life grew harder each day; none but those who passed through these days of trial can imagine the want and distress of the people.

By the spring of 1865 came the surrender of Lee and Johnson. "The soldiers straggled home, by rail, on foot and a few on broken-down horses, ragged, emaciated with hunger and disease, to find chimneys all that remained of their homes, forests cut away and fences burned. Sorrow, hunger and hopelessness had set its mark on every face."

A new era began. Of the 1513 white men and boys in Athens and the county in which it is located 1300 entered the army, nearly half of whom either were killed, died or were wounded. The few returned soldiers, the remnant left of the original 600,000, which had composed the army of the South, had fought for four years bravely against more than twice their number, "had fought with honor, surrendered with honor and abided the issue with honor," becoming once more loyal citizens, as demonstrated in the Spanish-American and the recent World War.

In May, 1865, Athens became a Federal garrison. The officers did all in their power to maintain order. Crowds of ignorant negroes flocked into the town from the surrounding plantations with the wild idea that they would no longer be required to work, and that each would be given "forty acres and a mule." Their boast was: "I don't have to work, I's free as a jay bird." The result was that in one day the Federal officers sentenced one hundred and fifty-one to become not "jay birds," but "jail" birds. The commanding officer made a speech advising them to go to work. "Labor," he said, "should not be taxed to support idleness. Go home and work for your former masters for such wages as they will pay you."

Only three from my father's plantation left, much to his regret, as the men spent their time hunting and fishing, not realizing their families must be fed. One by one hogs and sheep disappeared to appease the appetites of these idlers; thus the Southern farmer was forced to depend upon cotton as a staple crop.

To add to the burdens of the master, there were old men and women who in youth had given cheerfully of their strength and who for years had been relieved from work. Of these, there remained his old nurse and her son, who had been the playmate of his boyhood and whose wife had formerly been his mother's cook. The family history of these two had been interwoven with that of his own for more than a century. Poor, helpless and unhappy, they were assured of a home for the remainder of their lives on the old plantation, which they accepted with relieved hearts, and when Death called them they found their last resting-place in the plantation burying ground.

For economical reasons the number of servants was reduced in the home. Three of the most trusted remained for years, serving as before, but as wage earners. My mother often said, that she gained her freedom when slavery was abolished, and was glad to be relieved of so much responsibility.

The returned soldiers went to work to bring order out of chaos. Men unused to manual labor, with broken-down cavalry horses and some with only oxen, tilled the fields. Poverty had no sting, as it was almost universal. A few had saved their cotton which brought almost fabulous prices. Unfortunately Stoneman's raid was the occasion of my father's losing about eight thousand dollars' worth. Could it have been saved he would have been spared many hours of toil and care.

The negroes were beginning to adjust themselves to their new conditions, although many still remained in idleness. Business was approaching a stable basis when the Reconstruction Period began. A few of the lowest classes of native whites allied themselves with the carpet-bag régime. Negroes from the plantations, crazed with visions of lust and rapine, made life almost intolerable. They held secret incendiary meetings, parcelled out the handsome homes and boasted that they would make their selection of mistresses from the beautiful girls of the town. Women in the country feared to be alone, and men dared not venture forth unarmed. The better class of negroes holding aloof were contemptuously termed by them "white folks niggers."

Confiscation of all property was threatened and for the only time in my life, I saw my father almost in despair. "What can I do?" he exclaimed, "if my home and lands are taken from me? My stocks and bonds are worthless." My mother sought to comfort him; finally she said: "The day will come when you will be recognized as the discoverer of ether anesthesia." This but intensified his anguish. "Never again mention the word anesthesia to me," he replied with such poignancy of feeling that, young and thoughtless as I was, I realized how quietly and bravely he had borne this lack of recognition so many years. It was a matter which had never before been discussed in my presence.

The excitement and apprehension of political friction during the late fifties, the four years of the horrors of war, and the effort at adjustment to present conditions, toiling to support a large and helpless family, left him no time to brood over past injustice.

One of the most vivid pictures which remain to me on "Memory's Wall" is one of a little child who while playing by the fire saw her adored father enter the room with a hurried step, utter a few words to her mother, and with her ascend the stairs leading to the attic. Struck by his unusual manner of suppressed excitement, wondering that she had been ignored, as he neither spoke nor caressed her, indignant and curious, she followed. He unlocked a little green traveling trunk, took from it a package of papers, rushed back to his buggy and was driven rapidly away. My mother cautioned me never to play with the contents of the trunk, should it accidentally be left open, as the contents meant too much to my father. Years later I was told that they must be preserved as they would make my father a great man some day. Thus dimly do I recall Dr. Jackson's visit in 1854. Then followed oblivion as far as these papers or anything that pertained to them, until they were placed in my keeping at the time of General Stoneman's raid in 1864. Not until then did I realize fully their value.

My father was a man who bore disappointment and sorrow uncomplainingly, keeping them secret in his soul lest others be made unhappy, yet there were times when his utter silence made us realize his suffering, but there was never repining or bitterness. As expressed so beautifully by Dr. Chalmers DaCosta:

> He carried with him through life no ignoble rancor. Disappointment there must have been, but there was never hatred of his fellows. He had been excluded from honors that were justly his, but he never kept the thought of it as something to chew on when feeling Byronic. He in no sense became that desolate human calamity, an embodied grievance. A grievance wears out sympathies and tires out our appreciation. There was nothing morbid in his temperament. He never scoffed at Destiny or denounced Fate. He never claimed to be an unappreciated spirit or a misunderstood soul. He calmly went his useful way, tending the sick, aiding the needy, caring for his own, sure of himself, confident and fair to all, generous ever to opponents, courteous even to critics and making no struggle for stained wreaths or tarnished rewards. He was a complete man, a rounded character, a true physician. When we honor him we find no apologies necessary. He never tried to patent and thus coin into dollars a discovery that has brought and will bring comfort unspeakable to countless thousands of the race. He thoroughly loved his profession. He had that splendid combination, strength and tenderness.

A great burden was lifted from the hearts of the people when better counsels prevailed and they found the threat of confiscation would not be enforced. The South felt that had Abraham Lincoln lived they would have been spared the humiliation and horrors of that time. Their hopes revived and they went to work with renewed energy, to "make the waste places glad."

For some reason, of which my father was ignorant, he was treated in many ways by the officers of the garrison with much consideration, although he did not personally know them. To his great surprise the position of surgeon of the post was offered to him by Captain Trowbridge, who said that it was accorded him "for his skill in surgery and his reputation for honesty and integrity."

The contract reads thus:

War Department
Surgeon General's Office,
Washington D. C. May 28, 1867.

Dr. C. W. Long:

Sir: I have the honor to inform you that your contract with Brevet Col. C. F. Trowbridge, Captain 16th. Infantry, U. S. Army, dated April 25, 1867, Athens, Georgia, Clarke County, for duty at same place has this day been approved by the Surgeon General, J. S. Billings, &c.

This position was filled by him until civil government was enforced. Some of his friends were at first inclined to criticize him for accepting the position, but when they realized it was not a political move but an opportunity to use his influence in bettering the condition of the people, they recognized the wisdom of his acceptance, particularly as time progressed and they saw beneficent changes result from that influence. Captain Trowbridge was succeeded by Col. Blucher, a nephew of General Blucher, who arrived at Waterloo in time to decide the victory for the allies, and pursue the routed French army. Col. Blucher was bred to arms, and with him fighting was a profession. He died only a few years ago, I think at the Soldiers' Home in Washington.

In these dark days there was an air of dilapidation about the public buildings and homes, but men of all classes and conditions of life went to work to rebuild the waste places. Many of them, unfamiliar with manual labor, literally put their hands to the plough, and delicately nurtured women followed in the furrows sowing the grain. In a few instances where no draft animals could be obtained men pulled the ploughs and their wives guided the handles. Fortunately we had no such experiences, as Athens was not in the line of Sherman's march.

I know of one instance where two elegant and cultured young women, having no male members left in the family, painted the fence which enclosed the large grounds of what had been a handsome old home.

In 1874 adventurers and carpet-baggers, who had grown rich by bankrupting the State Treasury, left, and the state was once more under the control of her own citizens. Life had been for so many years full of privations and sorrows that peace and security were gladly welcomed and Georgians accommodated themselves to the new order of things.

Railroads were rebuilt, houses painted and deserted fields tilled again. The young men and maidens wedded and began life with the determination to make their fortunes.

Luxuries were beginning to be acquired, and the old hospitality was resumed to a great degree. As of yore the mistress of the home gloried in her hedges, flowers, fruits and vegetables.

Once more our stables were replenished and the daily afternoon drives were resumed. If our carriages were a little old-fashioned that was immaterial. It was no disgrace to be poor, an impecunious aristocrat, only inconvenient and uncomfortable. Music and dancing brightened our lives and we could afford to gratify our taste in dress.

There was money for books, and we could feed our souls. How we reveled in the new novels and essays! Every laddie read the "Idyls of the King" to his lassie, or quoted "Lucile" to her.

It was a proud day when my father subscribed for *Harper's Magazine*, Littell's *Living Age*, and *Appleton's Journal*, but the first periodical ordered by him after the war was the London *Lancet*. He never tired of Shakespeare's plays, and frequently quoted from them. In looking over the book in which he recorded his daily visits, under the name of one of his patients was written "Richard III, Act V, Scene 3," where Richard wakes from his dream, tormented by his conscience. He was the safe guardian of a great many secrets. In another place is a quotation from Tennyson. As children we thought his knowledge knew no limits. He translated our Latin and made our higher mathematics clear to us.

As a young man he was fond of dancing, and all of his life, of the theatre and opera, demanding the best acting and music, although he enjoyed a good minstrel show. He had a correct eye for form and taste in colors. Whenever he made a business trip to New York he returned with handsome gifts and expensive silks for his wife and sisters, and was a very close observer of ladies' dress. His children were trained never to wear imitation jewels or laces. He hated shams of every kind.

He was a very fine whist player, generally playing at home with a few friends or his family. He often engaged in a game of draughts with his wife. He enjoyed hunting and fishing, and was a wonderful shot with the rifle and pistol. He was fond of good horses and enjoyed, without betting, the races at the county fairs. His wife's carriage horses were from Kentucky, and his children were given ponies as soon as they were old enough to ride. He was a good business man, but his heavy practice forced him to leave his drug store as well as his two plantations in the hands of others much of the time. He had, for that day, very advanced ideas in agriculture.

He dressed well; he wore what was called a frock coat. A very dark dahlia was his favorite color, also black and dark gray. His suits, generally, were made to order by the best tailors, usually of broadcloth. He was particular in all his personal habits. The first day of May opened the season for wearing his immaculate white vests, which continued until November first. For a man of his size his hands and feet were small, and he was rarely seen in public without gloves. If we, his children, appeared without them we expected, and generally received, a rebuke. The sensitiveness of his touch was so great that it enabled him to detect some diseases. In the later years of his life he was deeply interested in a precocious young boy, Joseph Jacobs, the son of a Jew of high ideals, a musician, and poetic, yet a practical merchant. Joe's first duties were to polish and keep in order my father's cases of surgical instruments. Gradually he was promoted, and when sufficiently mature was sent each day to the university for instruction in chemistry. In his "Personal Recollections of Dr. Crawford Long," he says:

> He was quiet and unassuming in deportment and address, gentle and gracious in manner with all with whom he conversed, but with ever a retiring and modest mien. He was exacting and particular in business dealings for just and honorable results, and required order, cleanliness and system in all the appointments of the store and office. His kindly disposition and quiet good humor attracted many friends to visit and exchange pleasantries when duty allowed a short respite for social exchanges with his friends, who were the leading citizens and business men. His perfect self-control, kindliness and fine judgment gave him great influence and he was appealed to in many cases to arbitrate.

He was proud and sensitive; he never offered an insult, but it was well known that he would never take one. His friend, Judge Cobb, used to say there was nothing of which Long was afraid, but he would always dodge a bee. On one occasion, soon after the Civil War, when Athens was garrisoned by Federal soldiers, as he was returning home he heard screams in a nearby house, from which soon issued a woman and child pursued by a drunken Federal soldier. Instantly dismounting he jerked a paling from the yard fence and administered a beating to the drunken man, although the latter was heavily armed. He was sometimes satirical. In a conversation with friends one day he used the expression, "an aching void." A "Smart Alec," who was present, said: "Doctor, how can that be? No void can ache"; to which Long calmly replied: "Have *you* ever had the headache?" The quaint expressions of the ignorant were an unfailing source of amusement to him, though he was too careful of their feelings to allow them to see it. He once received a note from a patient: "Doctor, please come and see me; I am very sick; when I stands up I falls down; and when I goes to sleep I lies awake all night." When urged to take a rest he would say: "My sick need me." He was loved by both white and black, the latter often speaking of him as "Doctor Saviour."

Those who knew Dr. Long most intimately testify to the fact that he was "a man, and that nothing that pertains to a man was foreign to him," and his work shows that he had the courage of his convictions.

One of the rules of his life was: "If I cannot say a good word for a person I will say nothing."

He had a great reverence for womanhood. He would carry a basket for the lowliest woman with the courtly air others might show to a princess. A veritable termagant used to haul wood into town to sell. Again and again when he met her he bought the load and sent it to his own house. On one occasion Mrs. Long said to him: "We have plenty of wood, why do you always buy that woman's," and he said: "Because I hate people to see a woman doing a man's work." He would go any distance and attend the poorest negress in labor because of his sympathy for those in the pains of childbirth, and his reverence for maternity.

Having graduated in his academic studies at old Franklin College of Athens, he was always in touch with the affairs of the Alumni Association of the University and always enjoyed the spirit of celebration that pervaded the season at each annual recurrence of "Commencement."

I remember that amid the many and exacting duties of a large general practice, which it was ever his first and earnest care to fulfill, he yet found time to write, occasionally, a humorous sketch for the newspaper then published in Athens, *The Watchman*, edited by John H. Christy. These articles were contributed under the nom de plume of "Billy Muckle," and generally portrayed the "sonsie tricks, the failings and mischances" of some local celebrity, but the identity of the person always veiled by a fictitious name, and localities changed, so as to avoid offense. Yet these occurrences and characters were recognized by the doctor's more intimate friends, and he would have to "acknowledge the corn" when they would circle around him and claim discovery of the "target." It was a great pleasure to him, after some laborious season, or "toss wind o' trouble," to collect some of these friends for "rubbers" of whist.

He accepted all medical tasks as commands, which he was glad to be thought worthy to receive and execute. Once more his business was prosperous and his profession lucrative. The specialist or the city physician cannot conceive of the demands on the physical strength and skill of the general practitioner of that day, who was called upon to treat almost every disease. At one time an epidemic of smallpox prevailed, spread by wandering negroes; as my father had a number of cases, some of them of the confluent type, we were banished to the plantation until danger was over.

The home must have seemed very desolate in the absence of wife and children, as was evidenced in one of his letters:

When you return I shall feel like exclaiming with one of Shakespeare's characters: "Now is the winter of my discontent made glorious summer, and all the clouds that lowered o'er my house, are in the deep bosom of the ocean buried." You will be imprisoned at home for the balance of life when you return, and need not expect to escape from my clutches again. Goodbye, don't get too homesick, but be assured when you do come you will be gladly received and welcomed by

Your husband

Again he was called to a distant town where he found yellow fever, in another typhus fever, while typhoid and bilious fevers were prevalent. I remember upon one occasion a house was in so unsanitary a condition that he ordered the family moved out and the house destroyed. Cholera in 1854 was conveyed by a visitor from Mobile to his father's home. A few days later the guest, my grandfather, and a servant died from the dread disease.

He performed many surgical operations. Just a short while before his death he was called to amputate the leg of a man living in the country where he had first used ether as an anesthetic. As he was leaving the patient two old ladies (knowing he would be there) entered and with much feeling each kissed him. One felt that he had saved her life in a difficult case of childbirth and from the other he had removed a cancerous breast twenty-one years before. The latter, Mrs. Lucretia Weir McCleskey, lived to a vigorous old age, and died only a short time ago in her ninety-second year. When the operation was performed she was about forty-two years of age. He was very careful in breast operations to remove the glands under the arm and scrape the ribs; using these precautions there was never a return of the disease. He always refused to operate after the sore had come through the skin. The amount charged for a breast removal was never over one hundred dollars. He often spoke of the rapid increase of that terrible disease.

"Neither consideration of personal comfort nor bodily pain, the fatigue of sleepless nights nor incessant toil was permitted to interfere with the full discharge of his sacred obligations to those who sought relief at his hands." Day by day his labors and responsibilities increased. In a letter written to me in March, 1874, he says:

> For months I have been wanting to write to you, but whenever I have prepared to do so, something has occurred to prevent. This morning I had an engagement to go to Six Miles Station to perform an operation, came to the store with the expectation of taking the train at eight o'clock (the muddy roads making driving almost impossible) I found a note requesting me to wait for a few days, and for this reason, having a little leisure, I will employ it in writing.
>
> Do not attribute my failure to write earlier to lack of interest in your welfare; I feel as much affection for you and interest in your welfare as is possible for a father to feel in a good daughter. . . I have been very closely engaged by my profession, part of the time riding and exposing myself when I ought to have been at home.
>
> About the 20th of January I took a severe cold, and for three weeks did not have a moment's ease with my head, and yet was compelled to expose myself every day. I have not had leisure to go to the plantation, eight miles distant, this year.

With a character distinguished by such ennobling traits and such deeds of unselfishness and charity, he could not fail to command the confidence, admiration and patronage of the public who knew him. A fine type of the old school doctor.

My father's medical responsibilities seemed to grow heavier each day the last few months of his life. He was obliged to leave early in the morning, frequently not returning until late at night.

The night before he was seized by his fatal illness we were fortunate in having him with us at supper; we remained at the table for hours laughing over the trifling events of the day. He had never seemed more interested or more cheerful. Finally he grew serious and talked of life and its duties, then rising from the table he said with the greatest gentleness and tenderness: "No man ever had better children than I have." This was his farewell to us. When we next saw him he was unconscious, having fallen upon a patient's bed.

Three score and two years were granted him for the work to which he had been "called" by the Master Workman of us all. When death came it found him fulfilling the tenderest and the holiest duty that pertains to that work, the ushering of a new life into the world: as it came in, however, his own began to go out. With a supreme effort he forced from him for a moment the waters through which he was to pass on his outward way, for a moment the midnight which was to envelop him on that way, but which was to break at the end into glorious morning.

"Care for the mother and the child first," he managed to articulate to the watchers standing by when they would have ministered to him, then the waters and the darkness overcame him.

The noble and simple soul of Crawford W. Long passed as he would have had it pass.

One of the best analyses of Dr. Long's character and service to his community is given in the words of Dr. Lipscomb, the old chancellor of the university:

> Despite themselves men acknowledge purity and beauty of character. Had he not that nature and character which diffuse themselves silently and powerfully throughout a community and raise it to a higher level of sentiment and action? None of us was unmindful of his rare merits, and yet it was not until death smote him down, that we fully realized what a large space his virtues and services filled in our midst.
>
> There was nothing about him of what is called demonstrativeness. On the contrary he was a very quiet man, and quiet too, because thoughtfulness was the ruling habit of his mind. Though capable of being roused if circumstances justified a strong impulse, yet he held his force under the check of a beautiful repose. It was his aim to educate his temperament as well as his moral and intellectual qualities for the work of a

physician, and one who sets this ideal before him, must keep himself aloof from the noisy excitements of the day.

No doubt but this hindered him from quick access to the paths of prosperity and also delayed that prompt appreciation of his merits by others, which is dearer to most men of talent than success. Yet every step of such a man is a step towards the height of aknowledged excellence. Modesty may veil his worth but cannot conceal it; the hour is sure to come when the living man, like the finished statue of a great sculptor, will be unveiled before the public gaze; and then it is seen that the patience of self-possession and the absence of all haste in seeking recognition are the truest basis of reputation. One of the lessons of Dr. Long's life is, that worth will make its way to the reverence and admiration of mankind. Postponed it may be, but when the honor is attained, it never fails to repay the tardiness of time.

For nearly forty years he practiced medicine; with what skill, with what constancy of interest and sustained force of sympathy, with what calm enthusiasm of devotion I need not tell you whose homes are this day mourning over a bereavement, which is personal no less than professional to so many citizens of Athens and its vicinity. Personal and professional I repeat, for the man and the physician were united with singular closeness in his character and career.

The intellectual serenity, the truthful emotions, the unhurried painstaking that cautiously wrought out its conclusions, the resolute patience which kept his judgment suspended until all the facts were acquired and analyzed, the tolerance he had for doubt as long as doubt was a virtue of thought, the prompt and courageous vigor with which he acted when his mind was made up, the composure that surrounded him and in which as a finer atmosphere than that of breathing, he "lived and moved and had his being," the watchful solicitude that was anxiety of heart, the beneficence so responsive to the calls of the poor, and the deep tenderness towards womanhood in the sorrows of her life, so conspicuous in his whole history; these were qualities both personal and professional to the man, and they diffused themselves like a subtle aroma about his presence.

Dr. Long regarded his profession as a channel through which his inner and outer life might flow in blessing to the world. And in that channel it did flow; a stream tranquil but strong, a water from the Fount of the old Bethesda that bore healing to so many.

Dr. Long looked upon his profession as a providential vocation. To him it was not a mere work of humanity, it was more than this; and he accepted its tasks as a divine ordination, for which he was set apart by the touch of a Hand unseen. Occasionally his profound sensibility on the subject would break through his reserve, and then words touching this supreme concern would drop from the conscience of his soul.

He assumed nothing, pretended to nothing he was not, was thoroughly truthful in look, tone, manner and action, and simply, treated everyone considerately, and walked humbly before God.

Modest even to the verge of timidity when nothing serious was at stake, he was stern and bold and utterly self-forgetful if responsibility had to be met or danger confronted. A large fund of intensity lay hidden in the depths of his quiet nature, which answered with instant and eager force if duty summoned him to action. He had strength of will and much power of endurance. The minor heroisms which make up so large a share of a physician's experience, and of which the world knows so little, wrote many a paragraph in the annals of his life. Emphatically applicable to him were Wordsworth's lines, that,

> The facts of human existence
> Did take a sober coloring from an eye
> That had kept watch o'er man's mortality.

Over three score years were mercifully granted him, and through him to us, to Georgia and the world. Day by day strengthened his hold on our families and the community. All his recent growth, which was so manifest to the nearer circle of friends, was upward into clearer light and purer air. People said of him: "He is growing saintly."

It was noticeable, that the ideal of that profession, to which God has delegated the most solemn and pathetic trusts of our earthly being, steadily rose before his eye into loftier grandeur. Noticeable, too, was the fact, that his sympathies deepened for the sufferings of womanhood, and that with keener enlistments of studious thought and warm affection, he worked and toiled and sorrowed in the tragic hours of her agony.

> Nor did those nearest him fail to observe how his old habits of reading the Bible and attending to private devotion waxed stronger and dearer as his professional engagements multiplied.
>
> It became him thus to live. It became him thus to die while discharging the tenderest and holiest duty of his profession, by the bedside of a lady whose life was threatened.

I also quote from a tribute of respect signed by the physicians of Athens, July 6, 1878.

> Dr. Long was an honor to the profession, regarding it as a medium through which to make his life a blessing to the world. He was a high-minded Christian gentleman; always just and liberal towards his professional brethren, holding sacred their reputation as his own, by strictly observing the highest code of medical ethics in all his associations with them. He was never heard to make reflections or criticisms detrimental to any with whom he was called in consultation. As such all his neighboring practitioners held him in their highest esteem and confidence, and almost invariably Dr. Long was called on to attend the sick chamber of Physicians and their families. Truly did he subordinate his desire for fortune or fame, to the one great purpose of benefiting his race. His highest ambition was to do good and to leave the world better by his labors. Truth, honesty, and candor marked his character, while he cultivated the noble qualities of love and mercy.
>
> Not only did he visit the homes of wealth and luxury when called to relieve affliction, but was liberal in bestowing his benefactions to the poor, by carrying relief and comfort to the inmates of hovels, with no hope of reward but gratitude and love.
>
> His warm sympathy for woman was always manifest in his self-sacrificing devotion for her relief and comfort in her hour of trial and suffering, as was so nobly displayed in the very last act of his life.

There were many tributes from papers North and South, also from medical journals, but these extracts give an insight into a life whose uprightness and purity of purpose I am endeavoring to express.

Ten years after my father's death my mother lost her life in a railroad accident near San Antonio, Texas, in which city she was making her home at that time. The death of him to whom she had been so long united and upon whom she had lavished the devotion of her heart and the reverence of her spirit (she married at sixteen years of age and he was ten years her senior) cast an abiding shadow upon her naturally gay nature. She was a temperamental person, as are all the poetically inclined, the antithesis of her husband who was judicial and reflective; the very person needed as his complement. She believed in him; she encouraged him (for like others he had his dark hours); she loved him; in brief she was the inspiration of his life.

She found a sad pleasure after his death in writing reminiscences (all too few, alas) of their happy years together, which made delightful reading. Her descriptions of nature (she was the greatest nature lover I have ever known) are difficult to surpass. She drew these descriptions from the scenery of North Carolina, now known as "The Land of the Sky," in which section of the country she spent her summers. As the roads in those times were almost impassable, my father provided her with a strong carriage especially constructed for such journeys. One or two of her older children and a negro coachman usually accompanied her on her trips. Adventurous of soul, she was not to be daunted by any obstacle that might arise. I have known her more than once to take the reins from the coachman, when she feared he would lose his nerve, and to guide the pair of horses herself through streams to be forded or sudden storms or inky darkness.

Dr. Marion Sims sailed for Europe for an extended visit soon after publishing his plea to the medical profession to recognize Long as the discoverer of ether anesthesia. He scattered his pamphlets abroad, that foreign nations might become acquainted with the fact that Dr. Long's use of ether in surgical operations antedated that of the other claimants.

In the conclusion of this pamphlet he says of Sir James Simpson, who introduced chloroform and enlarged the domain of anesthesia: "Sir James received the highest honor from his government in recognition of the great service he had rendered humanity. I wish we could say the same of our benefactors and government. Our great republic too often leaves our discoverers and scientists to rest in obscurity and to starve." He then recounts the fates of Wells and Morton dying prematurely from disappointment at not receiving pecuniary recognition from Congress, Jackson hopelessly insane, and Long impoverished by the war. "How mournful the fate of these men! America should recognize the labor of Long and his co-workers. Let us as Americans rise above all party, all prejudice, all sectionalism, and demand of our government such an appropriation for the great work accomplished for science and humanity."

A few months later Dr. Long, who for months had been in failing health, died, leaving Dr. Jackson the sole survivor of the four claimants.

In July, 1879, Alexander H. Stephens, member of Congress from Georgia, and a man universally loved in his state, made the annual address to the alumni of the state university. His subject, "What is the chief end of men?" was an appeal to the graduating class to develop in themselves all that was highest and best mentally and spiritually in order that theirs might be lives of unselfishness and service. This address was the prelude to a wonderful tribute to his old friend and roommate, Crawford W. Long.

Mr. Stephens appealed to his audience to recommend that the State Legislature (then in session) petition Congress to accept the statues of General Oglethorpe and Dr. Crawford W. Long to be placed in the Hall of Representatives at Washington. The alumni met later and adopted the suggestion. Mr. Stephens was desirous, as was Dr. Sims, that Congress should make an appropriation to the family of Dr. Long or in some honorary manner reward his services to mankind.

Senator Benjamin H. Hill, Congressman Emory Speer, and other public men of Georgia were also deeply interested. The family, after considering the matter, decided that under no stress of circumstances would they apply to Congress for pecuniary recognition. They had undergone privation during the war and reconstruction days, and would again if it became necessary. Dr. Long's greatest desire, shared by his family, was that he should be recognized by the medical profession as a benefactor of mankind.

As is well known, Dr. Marion Sims, when he left Montgomery, Alabama, where he made his wonderful discoveries in the treatment of diseases peculiar to women, came without fortune and almost a stranger to the city of New York, where it was his ambition to establish a hospital for women.

He was so fortunate as to gain the friendship of Henri L. Stuart, who was a native of Vermont, but at that time a resident of New York and a man of wide influence through his connections, at various times in his career, with prominent newspapers. He was an intimate friend of Horace Greeley and was once associated with him on the New York Tribune and later became a warm personal friend of Whitelaw Reid, who succeeded Greeley. Mr. Stuart, who was active in all matters connected with public welfare, interested some of the wealthiest women and public-spirited men of the city in Dr. Sims' plan, and they accorded it loyal support. Dr. Sims himself always felt the successful establishment of the New York Woman's Hospital was largely due to Mr. Stuart's efforts.

It was said[3] that Mr. Stuart was one of the first to propose an Atlantic cable and the site of Central Park, also that he suggested the plan of the present city schoolhouses, introduced the piano into the public schools, and took a leading part in effecting a consolidation of the ward and public schools of the city. He aided the ladies of the Home Missionary Society in founding the Five Points Mission in 1851, and was one of the founders of the Normal College, as well as figuring prominently in many business enterprises. Through Dr. Sims' advocacy of the claims of the Georgia doctor to priority in the use of ether anesthesia, Mr. Stuart, who had studied medicine and was trustee of a medical college, became an equally ardent supporter. For years he had taken a lively interest in the Ether Controversy, and at first championed the claims of Dr. Horace Wells of Hartford, but afterwards, convinced that Dr. Long had used ether in surgical operations more than two years before Wells, transferred his support to the latter.

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[3] *Tribune*, New York, July, 1879.

Dr. Sims wrote my father to have six photographs made, full length, and of different views. As the latter was a very modest man he postponed the ordeal as long as possible, laughingly saying he had almost rather face a cannon than the camera, but Dr. Sims insisted on having the photographs, as he said the day would come when they would be needed for a statue. A large photograph of my father in a sitting position was also made and from this a life-sized portrait was ordered to be painted by the artist Frank G. Carpenter. The latter was presented with great ceremony at the State Capitol during the meeting of the Legislature, August 22, 1879.

Mrs. Elizabeth Thompson, of New York City, a philanthropist and a woman of large fortune, was associated with Mr. Stuart in his endeavors to ameliorate the condition of immigrants in the crowded cities of the North. Mr. Stuart spent two weeks in Atlanta to test the sentiment there in regard to receiving colonists and immigrants in Georgia. He found but one sentiment, and that most hospitable.

Mr. Stuart arrived in Athens in the month of September much exhausted by the heat. He was met by a delegation of Athenians who desired to express their appreciation of his interest in one of their citizens. He made an engagement to visit the cemetery the next morning. "I wish," said he, "to stand by the grave of that good and great man, Crawford Long."

The next morning found him paralyzed. He received every attention, but he passed away after an illness of three weeks. A stranger in a strange land, he was nursed by tender hands, buried by an admiring community, and now rests in the same burial-ground as the man whose life and whose labors he so admired.

This sketch would be incomplete if some recognition was not accorded to the efforts of scientific men from all sections of the United States and abroad who, after investigating the records, have through publications and in addresses brought my father's name before the world. Many articles published in newspapers and prominent medical journals carrying weight and influence must be omitted in this brief record, only the most comprehensive pamphlets can be considered.

The most important of the pamphlets favoring Dr. Long's priority in the use of anesthesia was that of Dr. Marion Sims, published in May, 1877, one year previous to my father's death. Until reminded of the fact by this distinguished author, the world had forgotten that in 1854 Dr. Long's claims, presented to Congress by United States Senator Dawson, of Georgia, were convincing enough to block the efforts of Wells, Jackson and Morton, then pending, for an appropriation. It had also forgotten that Jackson visited Athens, Georgia, in March, 1854, that he might examine into his Georgia rival's claims, and in a communication to the *Boston Medical Journal*, April 11, 1861, recognized the justice of them. This article appeared a few days before the firing on Fort Sumter. The excitement and horrors of civil war absorbed the minds of the people, and minor considerations were forgotten.

The pamphlet by Dr. Sims, being distributed by him abroad as well as in his native country, brought Dr. Long prominently before the world. Shortly after its publication Dr. Sims left New York for

Paris and other European cities for the purpose of performing operations in his special field of surgery. He was as widely known and as greatly admired for his signal success as a surgeon in Europe as in America. Endowed with a brilliant intellect and a magnanimous nature he won and held the hearts of men as few have done.

Among the first to give recognition to Dr. Long was Dr. David Cerna,[4] of Coahuila, Mexico, a learned physician of great prominence and wealth, whose address before the Academy of Science, and a pamphlet in Spanish, made our sister republic cognizant of the merits of the real discoverer.

In "La Escuelar de Medicina, Diario de Informacion," published in 1902, Ramon E. Trevino stated: "It is but fitting that the Legislature of Georgia should place the statue of Crawford Long in the National Gallery of Statues in Washington, but that is not enough. A statue of Crawford Long should be raised in every medical school, in every public institution the world over."

Dr. Luther Grandy of North Carolina became deeply interested. This interest was increased after his removal to Atlanta, where he made a careful examination of the papers in my possession relating to this subject, and had frequent interviews with Mr. Robert H. Goodman, who was one of the party of young men at whose request my father first administered ether for exhilarating purposes. It was to the latter that the young doctor, discussing the adventures of the night before, confided his belief that it was possible with this agent to produce complete unconsciousness, and his desire to do this when performing a surgical operation. It was also through him that the ether was purchased for the first painless operation, with ether as an anesthetic, March 30, 1842.

Dr. Grandy's first pamphlet was a reprint from an article published in the *Virginia Medical Monthly*, October, 1893. The second appeared in the *New York Medical Journal*, July 20, 1895. These irrefutable truths attracted much attention in this country and abroad, especially that of Dr. George Foy.

Dr. George Foy, M.D., F.R.C.S., F.R.A.M. of Great Britain, Honorable Fellow of the Surgical Gynaecological Association of the United States and the Virginia and Georgia medical societies, a resident of Dublin, Ireland, is a medical historian of note, a most learned and accomplished man, speaking and writing seven languages. Senior warden of the Episcopal Church, his prayer book is in Spanish, which he translates into English at the services.

He is a profound student of history, thoroughly acquainted with the conditions of American politics and has, I believe, the most vigorous and versatile mind of any man I have ever known. In addition to his mental attainments he has a warm heart and an intense loyalty to his ideals. This is proved by his espousal of such an apparently hopeless cause as my father's seemed to be in the early eighties. Not until many years later, and after his work seemed almost accomplished, did my sister and I meet him. One can readily fancy our grateful emotions on this occasion.

In a letter written to a Georgia physician he says: "I hunted up authorities in the British Museum Library and finally produced my book in 1886 and today, Dec. 24, 1910, I am thankful to say that Dr. C. W. Long is acknowledged as the discoverer by every one of our anaesthetists in Great Britain and my arguments in his favor have been translated into all the principal languages in Europe. Of one great fact I am sure, to wit: the principal anaesthetists of London recognize his claim to the discovery of general anaesthesia as well founded and in their hospital classes they so inform their students. Dr. Long's portrait occupies an honorable place in the rooms of the Royal Society of Medicine and will hold a similar position in the new building the society is erecting by Trafalgar Square at the cost of 30,000 pounds sterling. No writing or talking can now in London affect his position. It has been accepted and acknowledged by writers and teachers.

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[4] *Texas M. J.*, Austin, July, 1885.

When King Edward VII recovered consciousness after his operation for perityphlitis his first question was: "Who discovered anesthesia?" and the answer came back: "Dr. Crawford Long, your Majesty." During his convalescence the King expressed much interest in anesthesia, and learning of this Dr. Foy presented to him his book, entitled "Life of Crawford Williamson Long, Discovery of General Anaesthesia," beautifully printed and bound in dark blue kid, ornamented with gold and lined with blue satin, these being the King's colors. Two similar copies were made, one of them Dr. Foy reserved for himself, the other later he presented to my sister, Emma Long, and myself when we visited his home. It has been placed with the portrait of Dr. Long and other souvenirs of him in the Smithsonian Institution in Washington.

Of the gift to the King Dr. Foy wrote to us: "The acknowledgment is written throughout. This is the utmost ever given except to his personal friends, and is an unusual honor, for the ordinary acknowledgments are lithographed over the signature of the official Secretary Knollys."

The proofs of my father's discovery have several times crossed the continent that interested physicians might examine them, but they were to take a longer journey. In June, 1910, Dr. Foy wrote asking that we would permit Sir Frederick Hewett, the anesthetist for the present King, to exhibit these papers at the great medical meeting soon to be held in London, where representatives from all the British possessions including India and Australia would be in attendance. This was an honor we could not decline and, catching the first steamer, we sailed. Dr. Foy warned us that such busy men as the four most noted anesthetists of London, to whom the papers were to be submitted before being placed upon exhibit, could spare but a few minutes in discussing the matter, but so great was their interest, that hours were devoted to the examination of these papers in repeated interviews, to learn the history of this discovery. They developed a wonderful interest in the man himself and his personal characteristics, and learned of his love of reading the best English authors and familiarity with their poets, especially Shakespeare.

In two large cases in a prominent place in the British Medical Museum were placed the yellowed papers, which attracted much attention. At a luncheon given by Sir Frederick Hewett at Princess Restaurant, Piccadilly. Dr. Sisk, who was connected with one of the largest hospitals in London, startled me by asking if I wished to apply to the United States Government for a pension and if his endorsement would be of help. "No," I indignantly replied, "I do not want money but recognition of my father's claims." To my great surprise I learned that two sisters were receiving a pension because their father, an English physician, had administered ether as an anesthetic in his practice. But this was long after its first use in the United States, proving conclusively that the English surgeons were slow in adopting anesthetics to banish pain. This newly acquired knowledge explained Dr. Sisk's question.

I quote a letter received when in London from a distinguished physician, Dr. Bellamy Gardner.

July 31, 1920
126 Harley Street W.

Dear Madam:

As, no doubt, both you and Dr. George Foy must be aware, I am exceedingly anxious to hear the whole account and ascertain all the facts with regard to the first administration of ether for producing "surgical anesthesia" by Dr. Crawford Long in 1842; which not only involves the question of priority in the use of *ether;* but the credit of having been the first man to produce anesthesia by inhalation for surgical operations, even preceding the use of nitrous oxide for dental extractions.

Would it be possible for you to grant me an interview, so that I may have your account taken down in short-hand by a clerk at the same time on Tuesday next August 2 at 5:30 P.M. either here in my house, where we should be most pleased to welcome you, or at your hotel, whichever be the most convenient to you.

Before I throw my energy thoroughly into the subject in order to set the history of the discovery of surgical anesthesia before the *public* in England (not alone the Medical profession) I wish to know whether and to whom you have already furnished the account which you gave me on Tuesday night last at Dr. Dundas Grant's house, as, if Dr. Dudley Buxton has already done so *or* has obtained your assistance for him to undertake the publication of the facts as stated and authenticated by the documents shown at the B.M.A. meeting, it will not be necessary for me to spend time upon it also. I know you will understand the meaning of this request as I am just now so busy.

If I undertake the investigation and the publication I shall do it as completely as I think it certainly ought to be done in vindication of your Father's just rights.

I am, dear Madam,
Yours very truly,
H. Bellamy Gardner.

After replying to Dr. Bellamy Gardner that I had given Dr. Dudley Buxton permission to use the original papers for the sketch which he planned to write, I received the following letter.

128 Harley Street W.
August, 5, 1910.

Dear Mrs. Long Taylor:

I have written to Dr. Dudley Buxton telling him how pleased I am that he has undertaken the management of any measures to promote the publication of Dr. Crawford Long's claims to having introduced ether as an anesthetic. I am exceedingly obliged to you personally for the very great kindness with which you have devoted a considerable amount of your time to me in interviews, full notes of which I now possess.

After Dr. Dudley Buxton has first drawn the English public attention to the matter, I hope to prove in the full ventilation of the subject among the medical and lay press your Father's just rights.

With very kind regards and thanks
Believe me,
Yours very truly,
H. Bellamy Gardner.

Later Dr. Dudley Buxton published and sold his book entitled "Crawford Williamson Long, the Pioneer of Anesthesia and the First to Suggest and Employ Ether Inhalation in Surgical Operations."

An extract from an address made by John Chalmers DaCosta, M.D., L.L.D., Gross peofessor of surgery in Jefferson Medical College, Philadelphia, reads:

> December 1, 1911, Dr. Buxton, the distinguished English anesthetist, presented to the section of anesthetics of the Royal Society of Medicine an article which seems final and conclusive. It is written with that literary grace and painstaking accuracy which characterize all of Dr. Buxton's productions. In this article will be found a résumé of Long's life, the story of the discovery and reproductions of various convincing documents.
>
> Buxton's complete and masterly study may be read in the published proceedings of the Royal Society of Medicine, January, 1912. It gains greater emphasis by coming to us across the sea from a gentleman free of any possible prejudice or partiality. I do not stand here courting controversy. I am not obliged to search dusty records in order to clear up controverted points. I do not need to delve in obscure mines after the nugget of Truth, since Young, Foy, Buxton and others have found that nugget and the gleaming metal may be seen and tested by all men.

Among those seeking further information concerning the documents was the representative of Wellcome and Burrows, probably the largest firm of manufacturing chemists in existence. They desired to have them photographed and placed in a medical museum owned by Mr. Henry S. Wellcome, who has collected articles connected with every branch of medicine and surgery from all parts of the world. These will eventually be presented to the city of London to be entitled "The London Medical Museum." The photographs sought were later sent to him.

To return to American recognition: In 1879 Dr. Marcus Taylor, president of the Mississippi Medical Association, delivered an address before that body advocating the claims of the Georgia doctor. Later this was published in pamphlet form by the association.

The National Eclectic Medical Association at its annual meeting held at Cleveland, Ohio, June 18, 1879, unanimously passed the following resolution:

> Resolved that the Association takes this action to declare its appreciation and recognition of the inestimable service rendered to medical science and humanity and to express its consideration of the vast debt of gratitude (hitherto unrecognized) due to the late Dr. Crawford Long of Athens, Georgia, the discoverer of anesthesia, and hereby agrees to cordially unite in any public endeavor to honor his memory.

More than twenty years ago Louisiana testified to the justice of Dr. Long's recognition, as did prominent physicians in the Indian Territory, medical societies in Georgia, Alabama, Virginia, Tennessee, North Carolina and other states. Many letters from physicians and surgeons from every part of the Union bring us similar gratifying testimony.

In 1921 committees were appointed from the fourteen states and the District of Columbia, which compose the Southern Medical Association, to investigate the claims of the four contestants. It was unanimously decided in favor of Crawford Long at the following meeting of this association in 1922. It was especially emphasized at their last convention, November 12–15, 1923, at Washington.

Many papers have been read and published relative to the Long discovery, at conventions of international importance, one of the most complete, from a historic standpoint, being that of Dr. Hugh H. Young, who in 1896 was assistant surgeon at Johns Hopkins. Dr. Young, who was at that time in somewhat delicate health, having overtaxed his strength in completing a four years' course at the University of Virginia in two, and in equally arduous labors in a medical course at Johns Hopkins, returned to the home of his youth, San Antonio, Texas, for a brief rest and a visit to his parents, whom I was visiting on this occasion.

When Dr. Young learned of my relationship to Crawford W. Long he eagerly inquired if the papers concerning the discovery were in my possession and if so would I grant him permission to examine them.

Much time was spent sorting facts and arranging material. Every paper was put at his disposal and among them he found several letters written to me by Dr. John Groves, my father's first medical student. To him a letter was addressed by Dr. Young, who was desirous of settling some trivial points in criticism of Long's methods made by Dr. Morton. In reply Dr. Groves minutely described the operation, in which he assisted his preceptor in the removal of two fingers from a patient, early in 1845, a year and a half before the operation in Boston. "Dr. Long personally administered the ether. The patients did not etherize themselves and superintend the operation as Morton would have us believe." Dr. Young's painstaking methods enabled him to write a most accurate and illuminating pamphlet.[5]

In April, 1910, the Georgia Medical Association met in Athens. On the fly-leaf of the elegant brochure program which had been prepared for the meeting was the following dedication:

> To Crawford W. Long, M.D.
> Discoverer of Anaesthesia
>
> Illustrious son of Georgia, as a physician the examplar of his profession, as a scientist great by reason of what he accomplished, but as a humanitarian the beloved benefactor of mankind and the inspiration of all who labor in the cause of society, in memory of his contribution to the science of Medicine and of his gift to suffering humanity, this program is dedicated in love and resource by
>
> The City of Athens, Georgia.

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[5] Reprinted from *Johns Hopkins Hosp. Bull.*, Balt., Aug. and Sept., 1897.

One of the most interesting events of this large gathering of medical men was the unveiling of an imposing granite monument presented by Dr. Lamertine G. Hardman of Commerce, Georgia, to the Jackson County Medical Association, of which he is an honored member. It stands in the center of the public square facing the spot where the first painless operation in modern surgery was performed, the two-story, wooden building with the front room used as a drug shop and the room in the rear as the private office.

On each of the four sides of this monument in large letters, near the base, is the word LONG, also inscribed as follows:

In Memory of
Dr. Crawford W. Long,
The first Discoverer of Anaesthesia, the Great Benefactor of the Human Race.
Born in Danielsville, Madison County, Ga., November 1, 1815.
Died in Athens, Georgia, June 16, 1878.
Sulphuric Ether Anaesthesia
Was Discovered by Crawford W. Long March 30, 1842, at Jefferson, Ga.
Administered to James M. Venable for removal of a Tumor.
Given by
Dr. Lamertine Griffin Hardman, in the Name of His Father and Mother,
Dr. W. B. J. Hardman and Mrs. E. S. Hardman,
lifelong Friends of
Crawford W. Long,
Dr. W. B. J. Hardman being a Physician of Jackson County.
Erected by the
Jackson County Medical Society, April 21, 1910.
Committee:
H. W. Bell,
J. C. Bennett, M.D.
F. M. Bailey.
Unveiled by the
Georgia Medical Association
April 21st, 1910.

Preceding the unveiling the following resolutions were read by Judge H. W. Bell, representing the mayor and aldermen of the town of Jefferson, in meeting assembled:

1. That we express to Dr. Hardman our profound appreciation for this manifestation of his generosity and philanthropy in paying this splendid tribute to the distinguished deceased, thus bringing Jefferson, by this noble act of his, into unusual prominence and world-wide fame and distinction.

2. That we thank the Georgia Medical Association for lending their official presence on this auspicious occasion, thus giving to the world another public authentication of the proper place and person of this great discovery.

Judge Bell was followed by Dr. Will B. Hardman, brother of the generous donor, who welcomed the state organization and other visitors to Jackson County on behalf of the county medical society.

Dr. Thomas R. Wright of Augusta introduced the orator of the day, Dr. Woods Hutchinson of New York City. His address was replete with facts and figures sustaining Long's right to the honor of the discovery. He said in part:

> I deem it a peculiar honor and pleasure to be allowed to address this audience on this occasion. Without conceit I may say that I believe I am peculiarly fitted for this pleasant duty, for I am an unusually representative person. Born across the waters, in the country which gave Sir James Simpson, the discoverer of chloroform anesthesia, to the world, I am an Englishman by birth and an American by conviction. I have practiced medicine in three sections of the United States—the North, the South and the West. I am here to say that wherever men speak of the achievements of science an allusion is made to the greatest boon ever made to suffering humanity—anesthesia.
>
> Dr. Crawford Long's discovery was no accident. His real genius and the proof of his greatness lay in his wisdom to see the possibilities, the courage to attempt the experiments, the confidence in his own opinions and in the heartfelt love and sympathy for his suffering patients, which led him to employ the anaesthetic which he had discovered, not once but many times. He was great in his courage, braving the possibility of the fearful consequences which would have followed failure in those early days of experiment. He was great in his love for his profession and affectionate sympathy for his

patients. He was great in the breadth of his intellect, the culture of his mind, his familiarity and appreciation of letters and art and refinement. He was great in his services to his fellowman.

Prior to making his address Dr. Woods Hutchinson sought to learn from physicians in Athens and neighboring towns who were accustomed to call my father in consultation, and from patients whom he had relieved, his methods of treatment of various diseases. One case reported was of special interest to him, that of Mrs. Lucretia McCleskey, a woman then about ninety years of age, whose breast Long had removed for cancer fifty-three years before, in 1857.

Dr. Hutchinson therefore felt justified in declaring:

> In many matters he was ahead of his day and generation. He was one of the first to hold the belief that tuberculosis was curable and that fresh air and diet would effect cures of this dreadful malady. He was one of the first to discover that the bilious fever of the South is a form of malarial fever and that quinine is its specific remedy. He was also among the first to treat typhoid patients in almost the identical way in which the physicians of today handle that disease. He was years ahead of the record in the removal of a cancer from the breast of a woman by the famous Halstead operation. And he added to the sum of human immunity from horror and suffering long before Sir James Simpson used chloroform for the same purpose. Dr. Long here in Jackson County on more than one occasion employed ether as an anesthetic in the cases of childbirth he attended.
>
> Finally he was not only great in life, but he was greater in death, for the end came to him in service—falling ill while attending a patient, who sits in this audience today, and when he recovered consciousness for a moment before summons came, he thought only of duty and asked, "How is she?" gave directions as to her treatment, then lapsed into unconsciousness. Great in his life, humble and unassuming in his manner, broad in his research, and polished in his culture, faithful and devoted to his work and to his fellows to the very shadows, he was one whom we may all honor and emulate.

Hon. Pleasant A. Stovall of Savannah, later minister to Switzerland, was then introduced by President McArthur of the Georgia Medical Association. The former knew Dr. Long as the family physician during his boyhood days and young manhood. Forty years ago, one holding this office was the confidant not only of the physical but also of the mental ailments of the patient, and was the safe depository of many a secret sorrow. From his beautiful tribute I quote a few lines:

> For 5000 years or more man has been flying from the spectre of pain. The whole object of science has been to soften the process of life, to lessen the ills which flesh is heir to, and to postpone the inevitable hour. Herodotus wrote of inhaling the fumes of hemp to allay passing pangs and Pliny recorded the magic of mandragora. The Chinese in the third century had their own anaesthetic, and Sir Humphry Davy one hundred years ago prescribed nitrous oxide gas to relieve the penalties of local pain. But everywhere in history suffering had cried out for alleviation in vain and surgery had hunted for a truce without avail. The suggestion of the use of anaesthesia for practical work was unheeded.
>
> The fumes of sulphuric ether arose like the incense of the Magic from the Wonderful Lamp to work spells of unconsciousness, but until the middle of the last century the anaesthetic remained only a curious agency in the laboratory—food for pranks of medical students and stimulus for weird antics and strange spells—until the country physician in Jackson County in the small country town of Jefferson applied its power to James Venable and removed a tumor painlessly from his neck. Then it is not too much to say, the long night of barbarism was broken. The voice of suffering has in a measure been hushed. Surgery came into her own. The opportunity had arrived. Peace and quiet, and suspended animation, supervened and science entered upon her perfect work.
>
> If Crawford W. Long had not found the way someone else must have found it; but it is to the eternal credit of this faithful and skillful man that in the quiet of his village practice he reached an answer to the quest of ages.
>
> What cared he for fictitious notoriety. It was before the days of publicity which bodies

forth the form of things unknown and gives to "airy nothing a local habitation and a name."

There was no Georgia Medical Society in those days. The country was sparsely settled. The whole population of the state, white and slaves, was smaller than that of Atlanta, Georgia's capitol, today. News, even the most important, did not travel far.

We may not doubt that this Jackson County surgeon proceeded with all possible caution. He was a conservative man, with a general practice. How carefully he counted the pulse of his unconscious subjects; how he trembled at times when he led them unto uncertain shadows where sleep was such a suggestive counterpart to death, we may well imagine. Those of us who knew him well and loved him as he came and went among us here more than thirty years ago, when his name was a household word, and his step upon the door always a welcome sound, will remember that he was modest, earnest, sympathetic, faithful and true. And so like the faithful man, who knew his work, he was more intent upon healing the afflicted than upon perpetuating his name.

All honor to the man who first applied anaesthesia practically to surgery; who found a new agency for evading pain; who changed a freak into a great scientific aid; who experimented with a sportive agency and turned it to everlasting account; who paved the way from minor incisions to major operations; who built an arena where miracles might be wrought.

Immediately upon the conclusion of the speech of Mr. Stovall, Dr. L. G. Hardman presented Emma, the youngest daughter of Dr. Long, who drew the cord which released the white sheathing about the plain but imposing shaft of Georgia granite, and as the folds slipped down the base of the monument the large audience representing every section from almost every county in the state from the mountains of North Georgia to the Seaboard "rose as one man, bared and bowed their heads, and there arose a cheer, half reverent, half joyful, from their full hearts."

UNVEILING OF THE MEMORIAL TO DR. CRAWFORD W. LONG. UNIVERSITY OF PENNSYLVANIA, MARCH 30, 1912.

Seventieth Anniversary of the First Use of Ether as an Anaesthetic in Surgery.

This handsome bronze medallion which serves as a memorial to tell the story of the first operation represents the young doctor bending forward over a recumbent patient, dropping ether from a bottle held in the right hand on the towel that partly covers the patient's face and watching intently the patient's respiration. It is the conception of the eminent sculptor, R. Tait McKenzie, a Canadian but now of Philadelphia. With poetic sentiment he has surrounded a part of the likeness with a spray of poppies (symbolizing the sleep which falls upon the patient) which rises from either side of the plate bearing the words "Class of '39, Pennsylvania," while the circular inscription above his head runs in two lines, "To Crawford W. Long, First to use Ether as an Anaesthetic in Surgery, March 30, 1842," "From his Alma Mater." In the field to the left are the dates of his birth and death, 1815 and 1878.

The exercises of the unveiling were held in the Medical Building of the University before an audience composed of members of the faculty, students and visitors. Provost Edgar F. Smith presided and introduced the speakers, Dr. J. William White of the University and Dr. J. Chalmers DaCosta of Jefferson Medical College.

Dr. White's address began as follows:

> We have come here today to do honor to the memory of a son of Pennsylvania who was the pioneer, who actually led the world in what was perhaps the most momentous attack upon pain and suffering, and indirectly upon disease itself, ever made in the history of mankind.

He does not go into detail of the specific subject but draws attention to the labors of other sons of Pennsylvania who helped to prepare the field for the introduction of anesthesia, "and later to profit by it and by the discoveries that followed and largely resulted from it."

> The interdependencies of the sciences have long been recognized as has the often surprising way in which what is called "pure" science has led to practical results as beneficent as they were unexpected. It seems a far cry from the

experiments of our founder, Benjamin Franklin, with his celebrated kite, to the time nearly one hundred years later, when mankind

Mid deepening stillness watched one eager brain,
With Godlike will, decree the Death of Pain.

And yet these two occurrences of such tremendous importance to humanity are connected, and not remotely, by a chain of scientific events and some of the most important links of that chain were forged by our teachers and alumni. . . .

The University was fortunate in having as one of its first professors, Benjamin Rush, who has been called "The Father of Experimental Medicine," and "The Founder of Scientific Medicine." It was he who wrote in 1812 that he had reached the conclusion that "pain does not accompany child-bearing by an immutable decree of Heaven," and that he hoped "that a medicine would be discovered that should suspend sensibility and leave irritability or the power of motion unimpaired." It may well be that the echoes of such teaching reached and inspired Crawford Long who began the study of medicine only twenty-five years after the expression of this prophetic hope.

In 1838, when Dr. Long came to us, the reputation of the School was so extended that our alumni were filling the most important chairs in the chief medical schools of the country, two at Harvard, two in New York, two in Winchester, Virginia, four in Baltimore, six in Charleston, and some of our very best with our younger sister, the Jefferson Medical College. It may certainly fairly be said that when Crawford Long came here at the age of twenty-three, he found, as he could have found nowhere else in America, the scientific traditions, the intellectual stimulus to original thoughts and deeds; the atmosphere, in other words, that was favorable, probably essential, to his later achievement.

It is a gratification to think we are participating in exercises destined to add beyond cavil or future question the name of Crawford Long to that list of distinguished Pennsylvanians who have well and faithfully served their profession and their country. There it rightfully belongs and we may feel that his never-to-be-forgotten act will be more than ever an example and a source of pride to successive generations of our students and alumni. So great a feat may never be duplicated. It is not given to many to take the first step in wiping out immeasurable agony and suffering. It is well to think that in looking back the names of Crawford Long and the University of Pennsylvania will always be associated with the first of these, and that if we look forward, there is every reason to hope and believe that those names will be an inspiration to the thinkers, the investigators, and the discoverers of the future.

The address of Dr. White was followed by the unveiling of the medallion by Dr. Long's second daughter, Mrs. Florence Long Bartow. At the conclusion of this ceremony an eloquent address was made by Dr. John Chalmers DaCosta, representing the Jefferson Medical College.

Now and then a real leader, an original force, a truly great man comes into the world, and moves us as one inspired. He dares to lift the veil which hangs before the mysteries, the veil which lesser men are too ignorant to observe, too indifferent to regard, or too cowardly or incapable to displace. Such a man seeks truth and scorns wealth—courts labor and forgets ease—fights dragons and slays giants—is the slave to duty, is contemptuous of popularity, and finally wrings

the secret of deliverance forth
Whether it lurk in hells or hide in heavens.

He originates. Every institution, says Emerson, "was once the act of a single man."

All such men have earned the reverent love and the eternal gratitude of humanity. Love and gratitude are the debts men owe to the memories of the heroes of progress, because of their labors, pains, perils and sacrifices. What would have become of the world without such men?

When a man has found a radiant truth, has done some gleaming deed, but has received no tribute of praise or glory, it is a peculiarly grateful thing to see the conscience of the world awaken, and to find men place the name of their long neglected benefactor "On Fame's eternal beadroll."

Seventy years ago to-day, on the 30th of March, 1842, and in the little village of Jefferson, Jackson County, Georgia, anesthesia was first intentionally produced to permit of the painless performance of a surgical operation. This discovery was one of the greatest in the history of science and ranks in importance with the discovery by Harvey of the circulation of the blood—by Franklin of phenomena of electricity, by Jenner of vaccination, by Pasteur of bacteriology, and by Lister of antiseptic surgery. The giving of ether as a surgical anesthetic was not a haphazard accident, but was reasoned out from observations.

The man who first gave ether for surgical purposes was Crawford W. Long, a native and resident of the State of Georgia, and a graduate of the University of Pennsylvania in the class of 1839. There seems a peculiar adjustment to the eternal fitness of things in the fact that a son of the University founded by the great practical philosopher, Benjamin Franklin, should have made one of the greatest practical discoveries of all time.

Long's great discovery was not made in a splendidly equipped institution of world-wide fame, nor by a professor whose lecture room was packed with eager students, but by a modest, unassuming country doctor, dwelling in an isolated village. Truly! greater things for mankind have come from the hut than from the palace, from the peaceful country than from the roaring town.

We meet to-day in commemoration and celebration: in commemoration of the 70th anniversary of the discovery of ether anesthesia, and in celebration of the noble achievement of a great son of this grand old school.

With sympathetic instinct Dr. DaCosta divined his subject's aspirations and the accomplishment of these aims resulting in a noble life. He closes thus:

> Such was Crawford W. Long. The University of Pennsylvania this day hangs his likeness in the Hall of Fame with her noblest sons. He was an honor to his Alma Mater, an ornament to his profession, a glory to his country, and a benefactor of the human race.

No honors could have been more gratifying to my father's family than this public recognition from his Alma Mater. Thousands of Pennsylvania alumni learned of the facts of the discovery through the many special bulletins giving an account of the ceremonies of the unveiling of the medallion. Dr. Charles Johnson, of Champlain, Illinois, was so impressed after reading one of them that he decided to investigate the subject. A long correspondence with my sister, Mrs. Florence Long Bartow, gave him the desired information. She was admirably qualified to do this. Although greatly enfeebled from heart disease, she devoted the last years of her life to assorting the mass of evidence of our father's right to be entitled the "Discoverer of Anesthesia." It would be ungrateful in me to fail to acknowledge the great assistance her labor of love has been to me in writing this little sketch. Her systematic arrangement of all papers and memoranda and the copying of faded and worn letters has been of invaluable service.

Dr. Johnson, although very young at the time, was a surgeon in the Federal army during the war between the states, and later became an eminent practitioner in Illinois. From this additional information obtained from my sister he was convinced that through ignorance of the facts great injustice had been done. Prompted by this feeling he chose for his theme at the meeting of the Illinois State Medical Association, May 10, 1917, "Dr. Crawford Long, the Discoverer of Anaesthesia." It was an appeal for justice, logically and beautifully expressed. Later, in August, 1917, it was published in pamphlet form and entitled "Lest We Forget."[6]

One of the most forcible brief articles was written by Miss Rosa Pendleton Chiles.[7] It was not only a fine array of facts but so admirably worded that it has been frequently quoted by writers and speakers.

In July, 1903, when returning with my sister Emma Long from a trip to Europe, a few miles south of Charlottesville, Virginia, we suddenly felt ourselves thrown with violence against the seats of the car, two terrific crashes, glass shattered, trembling of the mighty machine, then quiet except for the shrieks and groans of the injured. The victims of the wreck were taken to Charlottesville where they were ministered to by Dr. E. M. Magruder, local surgeon of the Southern Railway Company.

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[6] *Illinois M. J.*, Aug., 1917.

[7] *Munsey's Mag.*, Aug., 1911.

I quote a part of the opening address made by him at a meeting of the Association of Surgeons of the Chesapeake and Ohio Railway, on September 5, 1914:

> While a medical student in the eighties I first became acquainted with the term "surgical anaesthesia" and was vaguely cognizant of the fact that some one had discovered it and that there had been a controversy concerning the discovery with several claimants of the honor; but I was not in possession of any data bearing upon their respective claims. I was called to a wreck south of Charlottesville. The injured were brought to Charlottesville for treatment and for a week I had the privilege of ministering to Mrs. Frances Long Taylor, the daughter of one of the men whose connection with the discovery of surgical anaesthesia has made him famous.
>
> As a consequence I learned much about the discovery, and interest which had been smouldering for years was fanned into a blaze. In the preparation of this paper the facts were obtained through the above-mentioned acquaintance and from writings of those who have profoundly studied the subject in its every detail.

Animated by the desire to be absolutely impartial, the claims of each competitor were investigated by Dr. Magruder, beginning with Dr. Charles T. Jackson, who received many honors from foreign societies and governments. He was not only a physician but a chemist and scientist of high reputation. In December, 1846 he sent a communication to the French Academy of Science claiming the honor of the discovery of surgical anesthesia by ether; that in February, 1842 he had thought ether would be applicable to surgery and in 1846 had suggested its use to Morton in dentistry.

> When Morton sought legal advice on October 1, 1846, with a view to obtaining a patent on the anaesthetic use of ether under the name of Letheon, his lawyer advised him that Jackson was entitled to the honor of the discovery. Jackson (being a physician) not wishing his name to be connected with the patent, resigned his interest to Morton for ten per cent of the profits.
>
> In 1849, when Morton claimed compensation from Congress on account of the Government's use of ether during the Mexican War, Jackson and the friends of Wells (who had committed suicide in 1848), also put in claims and in 1852 a memorial signed by 143 physicians in Boston and vicinity claiming for Jackson the exclusive discovery of surgical anaesthesia, was presented to Congress. Thus was precipitated the Ether Controversy which raged in Congress from 1849 to 1854.

Then came that dramatic moment when the bill was up for the final reading and the friends of Wells and Morton were awaiting the decision, and Senator Dawson arose to announce that Dr. Jackson had written him that none of the three claimants was entitled to compensation. Hearing of Dr. Long's use of ether in 1842, he had investigated his claims and gave him the credit. Dr. Jackson therefore withdrew from the contest. Thus ended the famous controversy.

To Dr. Horace W. Wells of Hartford, Connecticut, Dr. Magruder gives due credit for his efforts to introduce the use of nitrous oxide gas to relieve pain in the extraction of teeth. His first experiments were made December 11, 1844, two and a half years after Long used ether in surgery and a little after Carlton at Dr. Long's suggestion and supervision extracted a tooth either in November or early in December, 1844. Quoting from Dr. Welch of the Johns Hopkins Hospital in 1908, he says:

> There is no reason to doubt that if Horace Wells had presevered in his efforts he would have been able to perfect the method of producing anaesthesia by this gas and to demonstrate to the world the art of surgical anaesthesia. While he did not achieve this complete success, the credit which belongs to him is large and the name of Horace Wells should be held in honored remembrance.

Dr. Magruder continued: "Knowing that there is in Boston a monument of white marble connected with the discovery of surgical anaesthesia, I wrote to the Mayor and Health Department of that city and among other letters I received the following."

Health Department,
Boston, Mass., Sept. 1, 1914.
Dr. E. M. Magruder,
Charlottesville, Va.

Dear Doctor: The inscriptions on the monument in Boston are as follows:

NEITHER SHALL THERE BE ANY MORE PAIN.
TO COMMEMORATE THE DISCOVERY THAT THE
INHALING OF ETHER CAUSES INSENSIBILITY TO PAIN. FIRST PROVED TO THE
WORLD AT THE MASSACHUSETTS GENERAL HOSPITAL IN BOSTON OCTOBER
A.D. MDCCCXLVI (1846)
THIS ALSO COMETH FROM THE LORD OF HOSTS
WHICH IS WONDERFUL IN COUNSEL AND
EXCELLENT IN WORKING.—ISAIAH
IN GRATITUDE FOR THE RELIEF OF HUMAN SUFFERING BY THE INHALING OF ETHER A
CITIZEN OF BOSTON HAS ERECTED THIS
MONUMENT. A.D. MDCCLXVII (1867)
THE GIFT OF THOMAS LEE

Yours very truly,
F. H. Slack,
Secretary Boston Health Dept.

The above monument was erected during Morton's life time and consequently was not to his memory. The subject of it is, "The Good Samaritan."

F. A. Washburn,
Resident Physician, Massachusetts General Hospital, Boston, Mass.

The claims of Dr. W. T. G. Morton of Boston, Massachusetts, the third contestant in the controversy, are then considered by Dr. Magruder. He also gives an account of the medals and various honors conferred upon him both in this country and abroad. He closes his book with a thorough investigation of Long's claims and a comparison of his work with that of the three others.

The claims of Long rest upon practical demonstration by himself, the result of his own unaided thought and research almost in the wilderness, far from the centers of science and learning, in a country furnishing but few surgical opportunities and no hospital or publication facilities and abounding in professional opposition and public prejudice.

Yet under these adverse circumstances this man made the grandest discovery of the universe, and practiced surgical anaesthesia persistently from the time of his discovery, several years before that of any one else, until his death, undaunted by opposition and superstition. Long can justly claim priority of discovery with immediate practical demonstration and verbal publication of the real agent and its effects, and that unfavorable environment prevented immediate and universal adoption of his discovery.

He urged its employment by the medical profession in his vicinity. His operations were as public as they could be when his environment is considered, as there were always others present to witness them; but he had none of the facilities of a hospital nor the aid of world famous surgeons to furnish clinical material for rapid verification, demonstration and publication; there were convenient no newspapers, medical journals, railroads, telegraph or steamboats, to disseminate the news in centers of population and in distant parts of the earth; he made no secret of the agent used nor enjoined secrecy upon others; his discovery was known and discussed in medical and lay circles over a large extent of territory, and if the great scientific centers and if the world at large were ignorant of his work, it was through no act or desire of his.

In 1917 at a meeting of the Anaesthetists' Association in Louisville, Kentucky, Dr. Magruder read a most interesting paper on the personal characteristics and private life of my father.

Dr. Isham Goss, late of Athens, Georgia, a member of the State Board of Medical Examiners, American and State Medical Association and International Association of Railway Surgeons, and so forth, read a paper at a meeting of the Georgia Medical Association in Macon, April 1908, entitled "Long, His Discovery," which was published in pamphlet form later. While brief, it presented the leading facts of his life and discovery expressed in such finished and elegant style as to captivate all readers of it. Dr. Hansell Crenshaw, editor of the *Medical Consensus*, felt that he "desired to write an adequate and permanent record of Dr. Long's life and work" and produce an interesting tribute to his memory. In the introduction he says:

> The life of Crawford Long grows on one the more it is studied and the student feels better for having come in contact with the history of the great physician whose everyday life was an ornament and credit to the race.
>
> To medical men and particularly to the coming generation of them, this narrative should be a stimulus. Every man who practices or expects to practice medicine should study the life of some great physician and Crawford W. Long's character and accomplishments could well serve as a model for all followers of the healing art.

A Canadian, Dr. Donald T. Atkinson, who is a medical historian, has recently published "Life Sketches of Great Physicians." In the Library of the British Museum he found a number of rare books and manuscripts relating to the subject of medieval medicine, and from this source accumulated material for a most delightful book. Among the biographies he includes one of Dr. Long in which he justifies his claims.

In 1919 Dr. Joseph Jacobs of Atlanta published a brochure entitled "Dr. Crawford W. Long, the Distinguished Physician Pharmacist." It gives delightful personal recollections and private correspondence, and documentary proofs of his wonderful discovery. To this little book the *Medical Record* pays this tribute:

> Biographies are the very stuff of history. Rightly written and properly read, they are the most interesting and instructive literature. History is made by men; and the intimate story of these men is the story of the inner mechanism of their history-making achievements. It is this truth which, consciously or unconsciously, makes a well-done biography such facinating reading: which makes us all so eager to get hold of every little scrap of intimate personal narrative concerning the men whose names are household words.
>
> Dr. Jacobs has given us in the modest little book, a most absorbing and illuminating glimpse into the life and character of a man who is at once an interesting personality and a pioneer in modern medical science; to whose doubly interesting story is added the fascination of a long drawn-out controversy. Around the history of the introduction of ether as an anesthetic there has always been a good deal of confusion and uncertainty; and for that very reason it has been a most alluring story, quite apart from the excitement of the discovery itself.
>
> It must be said that Dr. Jacobs makes out a very powerful case for Dr. Long as the discoverer of ether anesthesia. The documentary evidence of his priority over other claimants is set forth in convincing order and undeniable authenticity. Especially convincing is that part of the record which pertains to the endorsement of his claim by the Georgia Medical Society and the physicians of Athens, where Dr. Long resided. To the unbiased mind the chain of evidence leaves no doubt as to the genuineness of Dr. Long's claim to priority.
>
> From the author's standpoint, this establishment of Dr. Long's claim is unquestionably the most important feature of the book. It is, in fact a noble effort of a loyal man to secure for his friend the place in the Hall of Fame to which he is thoroughly persuaded he is entitled. And this task Dr. Jacobs has well achieved. To our thinking, however, the book has a charm and an interest, quite apart from and altogether transcending its controversial aspect. It is the lovingly told story of a beautiful life told with all the intimate detail, and withal with the instinctive delicacy of a close and loving friend. Reading it, we, too, love and understand Dr. Long. Whether or not he was prior to this or that claimant in his discovery of anesthesia becomes for us a trivial matter; the all-important thing is that great, gentle soul spent his life in the service of suffering humanity, just as he lavished it on his devoted family, and that out of this unselfish spirit of service came his great pain-conquering discovery.

UNVEILING OF MONUMENT AT THE UNIVERSITY OF GEORGIA

On the afternoon of June 14, 1921, on the occasion of the one hundred and twenty first commencement exercises of the University of Georgia, was unveiled a handsome medallion in memory of Dr. Crawford Long. The monument, on the main driveway and in front of the Library, faces the old Chapel where eighty-six years before he had graduated. Large delegations were present from Danielsville, his birthplace, and from Jefferson, where he first operated with ether as an anesthetic. Many alumni and visitors from all parts of the state attended, an immense audience.

MONUMENT TO CRAWFORD W. LONG AT THE UNIVERSITY OF GEORGIA.

Chancellor Barrow, who was a boyhood patient of my father, presented the chairman of the trustees' committee in charge of the exercises. Judge Richard Russell, who told of his impressions as a boy of the famous physician, of his great personal dignity and his gentleness and refinement." He declared that this day would be long remembered; that it marked a distinct point in the movement to compel the world to recognize the truth and justice of Dr. Long's claims to priority in the discovery of anesthesia.

Judge Russell paid a merited tribute to Dr. Joseph Jacobs through whose generosity this beautiful medallion came into the possession of the University. He spoke of the years of untiring work of this former pupil of Dr. Long to present his claim for priority. He also paid tribute to Dr. Hardman of Commerce, who some years ago erected a splendid granite shaft in the city of Jefferson almost upon the very spot where the first operation was performed by Dr. Long, March 30, 1842.

Dr. Frank Boland of Atlanta, one of the most eminent surgeons of the state, appealed in a masterly manner to the alumni of the institution to do their duty towards asserting the truth as to this discovery and maintaining it.

> During its history of nearly a century and a quarter the University of Georgia has given to the state and the nation many men who have become celebrated in law and letters, in the pulpit and the schoolroom as orators, journalists, soldiers and statesmen, but not many who have achieved fame in medicine. But here is a physician given not only to the state and to the nation but to the whole world, one whose contribution marks him as one of the foremost benefactors of mankind. If this college had produced no other alumnus to reflect glory upon it than Crawford Long, such an accomplishment alone would make the state owe the institution an adequate endowment.
>
> The three outstanding events in the history of surgery have been its establishment as a science by John Hunter in the latter part of the eighteenth century, and the discovery of anesthesia by Crawford Long, and the application of Pasteur's germ theory by Lord Lister, in the middle of the nineteenth century.

He then dwells upon the immense value to the human race of Dr. Long's discovery, and says:

> Other anesthetics have been found and different methods of administration have come into

practice during the seventy-nine years which have elapsed since Long first employed ether to conquer pain, but in spite of this no better or safer way of anesthesia exists to-day than the simple one we see depicted on the medallion which is unveiled on this occasion. How then can we express our gratitude to our fellow alumnus, Dr. Joseph Jacobs, for the beautiful mile-stone which he had planted here to-day on the road toward convincing posterity of the truth of this discovery? It is from such deeds that we may hope to gain for Crawford Long his just reward . . . The alumni of the University, Dr. Jacobs, thank you for your generous and timely act in placing this handsome monument on the campus, it not only stands as a worthy memorial to your beloved instructor and to one of Georgia's citizens, but will also be a constant reminder to us of your untiring and unselfish efforts to secure for him the crown of immortality which he so richly deserves. Fellow alumni, three conspicuous qualities of Dr. Long's character should be an example to us. They were his power of keen observation, his courage and his gentleness. By the first two he was enabled to attain his brilliant success, and by the last he has won our undying admiration and love. Being a gentleman he could never be a charlatan. Not satisfied with things in his day, not satisfied to see humanity suffer, he sought and found means to prevent it.

Dr. Garnett Quillian of Atlanta spoke of Dr. Long as a charter member of the Georgia State Medical Association, who at its first meeting in the early fifties addressed the association on the subject of his discovery and submitted the evidence of his claims to priority which were enthusiastically endorsed by the body. Always interested in the Association, he attended its annual meeting a few weeks preceding his death.

Dr. Quillian's address was most eloquent. He enumerated the various honors which had been paid Dr. Long in this country and abroad, one being the Memorial Hospital upon the campus of the University of Georgia.

The measure of true greatness is determined by what one does, the spirit in which one does it, and its usefulness to the world. Gauged by these standards Crawford Long is truly great. His spirit of dignity, modesty, refinement and meekness was altogether worthy of his accomplishment. He sought not honors or gifts, but only to be a benefactor to humanity, and the usefulness of ether to the world needs of no exposition.

Dr. Hansell Crenshaw of Atlanta was to have spoken on "Dr. Long's Conquest of Pain," but at the last moment found he could not be present in Athens, and Judge Andrew Cobb was requested to take his place on the program. As with the other addresses I quote only a part. He considered first the desire to conquer that which opposes (a trait implanted in every human breast), in its selfish aspects and when accomplished has added nothing to the happiness of man; and, in contrast, this desire stimulated by a worthy motive.

When one chooses the calling of physician his aspirations must be high and his selfishness must be under control. His aspiration is to save the living from death and soothe the pain of the sufferer while he lives. Great is the man who dedicates his life to the relief of human suffering. Greater still is the man who by observation and research discovers that which conquers pain. Pain is a conqueror unless he be met and subdued. Crawford W. Long, by his discovery, for the benefit of all mankind, made proclamation to the conqueror pain:

> Ruin seize thee, ruthless king!
> Confusion on thy banners wail!

Let us this day as we dedicate this monument to the memory of our distinguished brother alumnus, pledge ourselves anew to the cause of the recognition of his discovery and continue the fight until every judgment of every misguided tribunal to the contrary has either been set aside and declared void, or shall be ignored by the justice loving people of the world.

At the conclusion of Judge Cobb's remarks, Dr. Joseph Jacobs, the generous donor of the medallion, presented it formally to the University as follows:

Mr. Chairman, Ladies and Gentlemen:

That I have been permitted to present this monument to the University of Georgia and that her trustees have accorded me the honor of its acceptance fills my heart with sentiments of gratitude and pride.

My early boyhood and all of my adolescent years were spent in this good city of Athens and of her I can truly say:

> Wherever I've roamed, what other realms to see,
> My heart, untravelled, has fondly turned to thee.

It was during those years of my life in Athens that Dr. Crawford W. Long, whose wonderful achievement we here commemorate, was my employer in pharmacy and my much respected tutor. The countless acts of friending by which he then benefited me, I have, in all the after years, treasured in recollection with "miser care." And, hence, in considering how I might in appropriate form attest some small measure of my appreciation of the man and his invaluable contribution to the welfare of humanity, I thought these shades in which he pursued his academic studies—here, at his alma mater—old Franklin College—the proper place for a record of its expression.

Dr. Crawford W. Long was a graduate of this University of the class of 1835. Although he completed a full medical course at the University of Pennsylvania and benefited by practical experiences in the hospitals of New York City, yet I have often thought, that, from the spirit of the motto of our University, the spirit of research—"et docere, et causas rerum exquirere" (both to teach and to seek out the causes of things), he formed the habit of clear and patient observation of facts, which enabled him in the exercise of his deeply humane and sympathetic nature, to make his unexcelled discovery in the realms of the curative science and for which he will be known in all future times as the conqueror of surgical agony.

The day, March 30, 1842, on which Dr. Crawford W. Long discovered ether anaesthesia will be known in the annals of the world as the date of the world's most important medical discovery.

Mr. Chairman, it affords me great pleasure to tender this monument and medallion to the University of Georgia.

Replying for the trustees, Judge Russell gracefully accepted the gift and then the medallion was unveiled by Mrs. Eugenia Harper, daughter of Dr. Long, the audience rising to its feet and standing at respectful attention during that solemn moment.

Arrangements have been completed by which a marble statue of Dr. Crawford W. Long, discoverer of anesthesia, will be placed in Statuary Hall in Washington.

The progress made by the Crawford Long Memorial Association, a corporation recently chartered for making and placing in Statuary Hall at Washington, D. C., the statue of the Georgia discoverer of anaesthesia by the use of sulphuric ether in surgery will be of interest to all who have deplored the delay of the state in providing this monument.

More than twenty years ago our general assembly voted the names of Long and Alexander Hamilton Stephens as the recipients of this honor. It was owing to want of constitutional authority to make appropriation for this purpose that our legislature failed to fulfill the design.

Largely through the efforts of Dr. Joseph Jacobs the State Medical Society was interested to complete the fund they had started. Dr. Jacobs as a young man was the pupil of the man whom he wished to honor. I quote from a recent newspaper interview with Dr. Jacobs: "Under the fine management of Dr. Frank Boland of Atlanta and president under our charter, the fund to be secured has been so nearly collected that, the contract for making the statue of Dr. Long has been awarded." It will be made of the best quality of Georgia marble from the Georgia Marble Company. It was from marble of these quarries that the heroic statue of Abraham Lincoln in the Lincoln Memorial was carved.

The sculptor will be J. Massey Rhind of Brooklyn, N. Y., designer of the wonderful fountain in Albany, New York, and of other notable works.

Thus is every hope that this monument will soon be ready for unveiling at Washington; there to attest the trust during her eternal years.

THE MEDICAL WISDOM OF MARK TWAIN

By LOUIS J. BRAGMAN, M.D.

SYRACUSE, N.Y.

A SEARCH through the works of Mark Twain for material touching on medical topics reveals a wealth of references, all the more interesting for the extreme diversity of content. Whether to be found in the swift stroke of a maxim by "Pudd'nhead Wilson," or in the casual reminiscences of his boyhood days, or in the well-rounded phrases of one who has seen and pondered much, there are always to be gleaned ideas of more than passing worth for the physician. For he dealt with medical matters as with other subjects, purely in the light of an absorbing phase of human activity.

There is but narrow ground for speculation in attempting to derive the source of his medical wit and wisdom. Discerning no particular contact with the healing profession other than that which is encountered by any cosmopolite, one is compelled to fall back on the medical experiences that occurred directly within his own family circle.

He himself was of a high-strung and undoubted neurotic make-up, as is evidenced by many events in his colorful career. He often fell into states of pessimism, and once declared that around 1866 he had felt so despondent that he put a loaded pistol to his head, but found the final courage to pull the trigger lacking.

It was furthermore his lot to bear the constant harrowing burden of chronic bronchial colds and rheumatism. Of angina pectoris, which terminated his life at the age of seventy-four, he remarked: "This is such a mysterious disease. If we only had a bill of particulars, we'd have something to swear at."

He was well acquainted with the ways of the family doctor, as will be seen in his various comments on the stern allopathic days of his youth, with the inevitable heavy dosings. Medical attention was frequently needed for his father, who up until the time of his death was prostrated every spring with "sun-pain," an acute form of headache, nerve-racking in character, and a complete obstacle to any kind of labor.

His wife was a frequent source of solicitude, as she was an invalid the greater share of her life. A fall when she was about eighteen had left her paralyzed. Despite persistent treatment she had remained unable to walk. Finally a widely-heralded quack healer was summoned. Inasmuch as he, in miraculously short order, restored her power of locomotion, it is not too presumptuous to state that there could have been no organic disturbance. However, this episode was bound to leave an impression upon the anxious husband and to direct the trend of his later thoughts.

One of his daughters suffered from epilepsy and was treated for a time by Kellgren, who was popularizing in London what were called the Swedish movements. Although at first he was strongly enthusiastic, Mark Twain later admitted that her progress was discouragingly slow. Her death in her early twenties following a convulsive seizure was a severe blow to him.

He survived her by only four months. "He was tired, and with Jean's death his strength snapped."

These scant items truly provide a slim background for his many ventures into the medical sphere. Perhaps it was, after all, merely the universal interest that notes on health and illness always arouse that prompted his pen on these occasions. The truth remains that he left behind many medical facts and fancies of worthy and enduring caliber.

THE MIND OF MAN

Insanity. The murder of the Empress of Austria[1] by an obscure, "mangy tramp" caused him to express the opinion that:

> No man has a wholly undiseased mind; that one way or another all men are mad . . . All the whole list of desires, predilections, aversions, cares, griefs, regrets, remorses, are incipient madness, and ready to grow, spread, and consume when the occasion comes. There are no healthy minds, and nothing saves any man but accident—the accident of not having his malady put to the supreme test.

Of the relation between psychosis and crime he wrote[2]:

> Insanity is certainly on the increase in the world, and crime is dying out. Formerly if you killed a man, it was possible that you were insane—but now, if you, having friends and money, kill a man, it is *evidence* that you are a lunatic. In these days, too, if a person of good family and high social standing steals anything, they call it kleptomania, and send him to the lunatic asylum. If a person of high social standing squanders his fortune in dissipation, and closes his career with strychnine or a bullet, "Temporary Aberration" is what was the trouble with him.
>
> Is not this insanity plea becoming rather common? Is it not so common that the reader confidently expects to see it offered in every criminal case that comes before the court? . . . Of late years it does not seem possible for a man to so conduct himself, before killing another man, as not to be manifestly insane. If he talks about the stars, he is insane. If he weeps over a great grief, his friends shake their heads, and fear that he is "not right" . . . Really, what we want now, is not laws against crime, but a law against *insanity*.

In a similar vein he dedicated one of his books "To the Late Cain"[3]:

> Not on account of respect for his memory, for it merits little respect; not on account of sympathy with him, for his bloody deed placed him without the pale of sympathy; but out of a mere human commiseration for him that it was his misfortune to live in a dark age that knew not the beneficent Insanity Plea.

He summed up his attitude on the important problem with the following witticism:[4] "The way it is now, the asylums can hold the sane people, but if we tried to shut up the insane, we should run out of building materials."

Brain versus Mind. In a philosophical discourse[5] attempting to prove that man is an automaton, he submitted the viewpoint that "A man's brain is so constructed that *it can originate nothing whatever.* It can only use material obtained from the outside. It is merely a machine and it works automatically, not by will power."

As an example of the materialistic nature of the mind, he argued to this effect:[5] "A cracked skull has resulted in a crazy mind. Why should that happen if the mind is spiritual, and *independent* of physical influences? . . . When you have a pain in your foot, you do not feel it until the nerve reports the hurt to your brain. Yet the brain is the seat of the mind."

Mental Telegraphy. He was a firm believer in the workings of the phenomena described under this head. He himself invented the phrase which later was altered to read "mental *telepathy*."[6]

> I have never seen any mesmeric or clairvoyant performances which were in the least degree convincing . . . but I am forced to believe that one human mind (still inhabiting the flesh) can communicate with another over any sort of a distance and without any *artificial* preparation of "sympathetic conditions" to act as a transmitting agent.

The Decline of the Mind. A note on this topic recalls an old controversy:[6] "Is it true that the sun of a man's mentality touches noon at forty and then begins to wane towards setting? Dr. Osler is charged with saying so."

CLINICAL OBSERVATIONS

The Black Death. While journeying through the Orient[4] he came in contact with the ravages of the bubonic affliction. "The plague," he related, "carries with it a terror which no other disease can excite, for of all diseases known to man it is the deadliest . . . 'Fifty-two fresh cases—all fatal': It is the Black Death alone that slays like that." It was truly malignant with its "terrors that creep into a man's heart at such a time until they themselves breed the fatal sign in the armpit, and then the delirium with confused images . . . and then the sudden blank of death."

The following especially vivid passage which he thought worthy of quoting at length is by Kinglake, an English traveler who was in Cairo during an epidemic of the Black Death:[4]

> The parched mouth is a sign—his mouth *is* parched; the throbbing brain—his brain *does* throb; the rapid pulse—he touches his own wrist (for he dare not ask counsel of any man lest he be deserted), he touches his wrist, and feels how his frighted blood goes galloping out of his heart. There is nothing but the fatal swelling that is wanting to make his sad conviction complete; immediately he has an odd feeling under the arm—no pain, but a little straining of the skin; he would to God it were his fancy that were strong enough to give him that sensation; this is the worst of all. It now seems to him that he could be happy and contented with his parched mouth, and his throbbing brain, and his rapid pulse, if only he knew that there were no swelling under his left arm; but dares he try?—in a moment of calmness and deliberation he dares not; but when for a while he has writhed under the torture of suspense, a sudden strength of will drives him to seek and know his fate; he touches the gland, and finds the skin sane and sound, but under the cuticle there lies a small lump like a pistol-bullet, that moves as he pushes it. Oh! but is this for all certainty, is this the sentence of death? Feel the gland of the other arm. There is not the same lump exactly, yet something like it. Have not some people glands naturally enlarged?—would to Heaven he were one! So he does for himself the work of the plague, and when the angel of Death thus courted does in deed and truth come, he has only to finish that which has been so well begun; he passes his fiery hand over the brain of the victim, and lets him rave for a season . . . there's the devil to pay in the brain of the poor Levantine . . . and the next night he becomes the "life and soul" of some squalling jackal family, who fish him out by the foot from his shallow and sandy grave.

Teratisms. He has described here a veritable pathological side-show, of which he himself was an eye-witness:[20]

> If you would see the very heart and home of cripples and human monstrosities, go straight to Constantinople. A beggar in Naples who can show a foot which has all run into one horrible toe, with a shapeless nail on it, has a fortune—but such an exhibition as that would not provoke any notice in Constantinople . . . How could he stand against the three-legged woman, and the man with his eye in his cheek? How would he blush in the presence of the man with fingers on his elbows? Where would he hide himself when the dwarf with seven fingers on each hand, no upper lip, and his under jaw gone, came down in his majesty? Bismillah! The cripples of Europe are a delusion and a fraud. The truly gifted flourish only in the byways of Pera and Stamboul.
>
> That three-legged woman lay on the bridge, with her stock-in-trade so disposed as to command the most striking effect—one natural leg, and two long, slender, twisted ones with feet on them like somebody else's forearm. Then there was a man further along who had no eyes, and whose face was the color of a fly-blown beef-steak, and wrinkled and twisted like a lava-flow—and verily so tumbled and distorted were his features that no man could tell the wart that served him for a nose from his cheekbones. In Stamboul was a man with a prodigious head, an uncommonly long body, legs eight inches long, and feet like snow-shoes. He traveled on those feet and his hands, and was as sway-backed as if the Colossus of Rhodes had been riding him . . . Ah, a beggar has to have exceedingly good points to make a living in Constantinople.

Note on the Awa Root. In Honolulu[24] he saw the following:

> A crowd of natives [was] buying the *awa* root. It is said that but for the use of this root the destruction of the people in former times by certain imported diseases would have been far greater than it was, and by others it is said that this is mere fancy. All agree that *poi* (prepared from the *taro* plant) will rejuvenate a man who is used up and his vitality almost annihilated by hard drinking, and that in some kinds of diseases it will restore health after all medicines have

failed; but all are not willing to allow to the *awa* the virtues claimed for it. The natives manufacture an intoxicating drink from it which is fearful in its effects when persistently indulged in. It covers the body with dry, white scales, inflames the eyes, and causes premature decrepitude.

PERSONAL HYGIENE

Smoking. He had smoked, by his own admission, since the age of nine, and naturally wondered whether any deleterious result would ensue.

"I am an excessive smoker, and I said that some of us must take warning by *his* case, but Dr. Douglas said that this result must not be attributed altogether to smoking."[7] This remark was in reference to the cancer at the root of the tongue from which General Grant was suffering. The doctor added that "it was probable that it had its origin in excessive smoking, but that was not the certain reason of its manifesting itself at this time; that more than likely the real reason was the General's distress of mind and year-long depression arising from the failure of the Grant and Ward firm," producing an embarrassing state of poverty.

Abstention. In an anti-Puritanic tone he flayed the so-called ascetics:[7]

> I doubt if God has given us any refreshment which, taken in moderation, is unwholesome, except microbes. Yet there are people who strictly deprive themselves of each and every eatable, drinkable, and smokable which has in any way acquired a shady reputation. They pay this price for health! And health is all they get for it. How strange it is! It is like paying out your fortune for a cow that has gone dry.

Fasting. One wonders whether the following explanation arose from personal experience:[4]

"I think that all the Dr. Tanners and those others who go forty days without eating do it by resolutely keeping out the desire to eat, in the beginning, and that after a few hours the desire is discouraged and comes no more."

AT THE HEALTH RESORTS

Austria. In the guise of humor he has here set forth,[8] according to Howells, a very sound idea concerning dietetics:

> The Austrian Empire is made up of health resorts; it distributes health to the whole world. Its waters are all medicinal. They are bottled and sent throughout the earth; the natives themselves drink beer . . . All unhealthy people ought to domicile themselves in Vienna, and use that as a base, making flights from time to time to the outlying resorts, accordto need. A flight to Marienbad to get rid of fat; a flight to Carlsbad to get rid of rheumatism; a flight to Kaltenleutgeben to take the water cure and get rid of the rest of the diseases.

Marienbad he designated the "health factory," and Aix the "paradise of rheumatics."

He himself went to the Appetite Anstalt, at Hochberghaus, where defunct appetites are restored. When he was first shown the menu, his "stomach threw a handspring. At the top stood 'tough, under-done, overdue tripe garnished with garlic; halfway down the bill stood 'young cat; old cat; scrambled cat'; at the bottom stood 'sailor-boots, softened with tallow, served raw' . . . The idea of coaxing a sick man's appetite back with this buzzard fare is clear insanity."

Of course the concept was to create a craving by first causing a repulsion. After this would follow hunger, "nature's appetite cure, the best and wisest in the world." The scheme was simple: "Don't eat 'till you are hungry. If the food fails to taste good, fails to satisfy you, rejoice you, comfort you, don't eat again until you are *very* hungry. Then it will rejoice you—and do you good, too.'"

He knowingly put his theory in this form:

> All diets are wholesome. Some are wholesomer than others, but all the ordinary diets are wholesome enough for people who use them. Whether the food be fine or coarse it will taste good, and it will nourish if a watch be kept upon the appetite and a little starvation introduced every time it weakens.

In a very whimsical manner he revealed the secret springs of the spas:

> Do you know the tricks that the health-resorts doctors play? . . . Covert starvation. Grape-cure, bath-cure, mud-cure—it is all the same. The grape and the bath and the mud make a show and do a trifle of the work—the real work is done by the surreptitious starvation. The patient accustomed to four meals and late hours—at both ends of the day—now consider what he has to do at a health resort. He gets up at six in the morning. Eats one egg. Tramps up and down the promenade two hours with the other fools. Eats a butterfly. Slowly drinks a glass of filtered sewage that smells like a buzzard's breath. Promenades another two hours, but alone; if you speak to him he says anxiously, 'My water!—I am walking off my water!—please don't interrupt,' and goes stumping along. Eats a candied rose-leaf. Lies at rest in the silence and solitude of his room for hours; musn't speak, musn't read, musn't smoke. The doctor comes and feels of his heart, now, and his pulse, and thumps his breast, and his back, and his stomach, and listens for results through a penny flageolet; then orders the man's bath—half a degree, Reamur, cooler than yesterday. After the bath, another egg. A glass of sewage at three or four in the afternoon and promenade solemnly with the other freaks. Dinner at six—half a doughnut and a cup of tea. Walk again. Half-past eight, supper—more butterfly; at nine, to bed. Six weeks of this régime—think of it. It starves a man out and puts him in splendid condition. It would have the same effect in London, New York, Jericho—anywhere.

Germany. At Baden-Baden:[8]

> They are racked with rheumatism, and they are there to stew it out in the hot baths . . . People say that Germany with her damp stone houses is the home of rheumatism. If that is so, Providence must have foreseen that it would be so, and therefore filled the land with these healing baths. Perhaps no other country is so generously supplied with medicinal springs as Germany. Some of these baths are good for one ailment, some for another; and again, peculiar ailments are conquered by combining the individual virtues of several different baths. For instance, for some forms of disease, the patient drinks the native hot water of Baden-Baden, with a spoonful of salt from the Carlsbad springs dissolved in it. That is a dose not to be forgotten right away.

One goes to the Leukerbads to remove fat and cure skin diseases. The water at this particular place runs continuously, otherwise "a patient with a ringworm might take a bath with only a partial success, since while he was ridding himself of the ringworm, he might catch the itch."

Australia. The period in which the following remarks[4] were made was obviously pre-Volsteadian:

> It is in Auckland that one goes to Rotorua, the region of the renowned hot lakes and geysers . . . The Government has a sanitarium there, and everything is comfortable for the tourist and the invalid. The Government's official physician is almost overcautious in his estimates of the efficacy of the baths, when he is talking about rheumatism, gout, paralysis, and such things; but when he is talking about the effectiveness of the waters in eradicating the whiskey-habit he seems to have no reserves. The baths will cure the drinking-habit no matter how chronic it is—and cure it so effectively that even the *desire* to drink intoxicants will come no more. There should be a rush from Europe and America to that place; and when the victims of alcoholism find out what they can get by going there, the rush will begin.

India.

> At the Keda Ghat you will find a long flight of stone steps leading down to the river. Half way down is a tank filled with sewage. Drink as much of it as you want. It is for fever.
>
> Go straight from there to the Central Ghat. At its upstream end you will find a small white-washed building which is a temple sacred to Gitala, goddess of small-pox.[4]

Thus do men in different climes pursue the evanescent shadow of health and well-being.

PRACTICAL THERAPY

The Everlasting Cold. He once remarked, pertinent to a life-long annoyance:[3] "I do not mention a couple of colds in my head, because I hardly mind them as much as I would the erysipelas."

Experience had taught him a simple rationale of treatment:[10]

"When you have any ordinary ailments, particularly of a feverish sort, eat nothing at all during twenty-four hours. That will cure it. It will cure the stubbornest cold in the head, too. No cold in the head can survive twenty-four hours of modified starvation."

Except, of course, the *unyielding* cold, as he found on a certain occasion:[10]

> My constitution succumbed to a severe cold . . . The first time I began to sneeze, a friend told me to go and bathe my feet in hot water and go to bed. I did so. Shortly afterwards another friend advised me to get up and take a cold shower bath. I did that also. Within an hour another friend assured me that it was policy to "feed a cold and starve a fever." I had both. So I thought it best to fill myself up for the cold, and then keep it dark and let the fever starve a while.

But to no avail. Next he tried drinking a quart of warm salt water (more *friendly* advice). The consequence was that he thought he had "thrown up his immortal soul."

Then a woman offered her services as *administering* angel. "She mixed a decoction composed of molasses, aquafortis, turpentine, and various other drugs, and instructed me to take a wine-glassful of it every fifteen minutes. I never took but one dose; that was enough; it robbed me of all moral principles, and awoke every unworthy impulse of my nature."

Naturally the last remedy employed received the credit.

> Plain gin was recommended. I took it. Then gin and molasses. I took that also. Then gin and onions. I added the onions, and took all three . . . A lady told me to drink a quart of whisky every twenty-four hours, and a friend recommended precisely the same course. Each advised me to take a quart; that made half a gallon. I did it and still live . . .
>
> I offer for the consideration of consumptive patients the variegated course of treatment I have lately gone through. Let them try it; if it don't cure, it can't more than kill.

Membranous Croup. This story[27] depicts the usual pediatric difficulty. The doctor had ordered a teaspoonful of medicine for the sick child, to be given every hour.

"Once an hour!" the mother strenuously objected, "as if we had a whole year before us to save the child."

So she gave, instead, "a tablespoonful every half hour, plus belladonna, aconite, goose-grease to the chest, flax-seed poultice, sinapisms, and other sorts of blisters where unoccupied places could be found upon the child."

MEDICAL HISTORY

Reminiscences. How well he knew the physician of the period around 1850, of the days of his youth.[7]

> I remember two of the Florida doctors . . . They not only attended an entire family for twenty-five dollars a year, but furnished the medicines themselves. Good measures, too. Only the largest persons could hold a whole dose. Castor oil was the principal beverage. The dose was half a dipperful, with half a dipperful of New Orleans molasses added to help it down and make it taste good, which it never did. The next standby was calomel; the next rhubarb; and the next, jalap. Then they bled the patient, and put mustard plasters on him. It was a dreadful system, and yet the death rate was not heavy. The calomel was nearly sure to salivate the patient and cost him some of his teeth. There were no dentists. When teeth became touched with decay or were otherwise ailing the doctor knew of but one thing to do—he fetched his tongs and dragged them out. If the jaw remained it was not his fault. Doctors were not called in cases of ordinary illnesses; the family grandmother attended to those. Every woman was a doctor, and gathered her own medicines in the woods, and knew how to compound doses that would stir the vitals of a cast-iron dog. And then there was the "Indian doctor," a grave savage, remnant of his tribe, deeply read in the mysteries of nature, and the secret properties of herbs; and most backwoodsmen had high faith in his powers and could tell of wonderful cures achieved by him.

Ancient Medicine. He had often laughed at a curious medical work early in his career. It was the "Dictionary of Medicine," by

Dr. James, of London, and was first published in 1745. The advice it contained was believed in with utmost confidence and faith, and as a consequence it enriched the earth with its slain for over three and a half generations.

Being rich in uncritical praise of ancient lore merely because of its *antiquity*, it proved to be, in the hands of Mark Twain, an easy butt for ridicule:[11]

> Take a single detail, for example—medicine. Galen could have come into my sick-room at any time during my first seven years—I mean any day when it wasn't fishing weather, and there wasn't any choice but school or sickness—and he could have sat down there and stood my doctor's watch without asking a question. He would have smelt around the wilderness of cups and bottles and vials on the table and the shelves, and not missed a stench that used to gladden him two thousand years before, nor discover one that was of a later date. He would examine me and run across only disappointment—I was already salivated; I would have him there, for I was always salivated, calomel was so cheap. He would get out his lancet then; but I would have him again, our family doctor didn't allow blood to accumulate in the system. However, he would take a dipper and ladle, and freight me up with old familiar doses that had come down from Adam to his time and mine; and he would go out with a wheelbarrow and gather weeds and offal, and build some more while those others were getting in their work. And if our reverend doctor came and found him there, he would be dumb with awe, and would get down and worship thim. Whereas if Galen should appear among us to-day, he could not stand anybody's watch; he would inspire no awe; he would be told he was a back number, and it would surprise him to see that fact counted against him, instead of in his favor. He wouldn't know our medicines; he wouldn't know our practice; and the first time he tried to introduce his own, we would hang him.

Blood-letting truly was a fine art in those sanguinary days:

> Phlebotomy, Venesection—terms used to signify bleeding—are not often heard in our day, because we have ceased to believe that the best way to make a bank or a body healthy is to squander its capital; but in our author's time the physician went around with a hatful of lancets on his person all the time, and took a hack at every patient whom he found still alive. He robbed a man of pounds and pounds of blood at a single operation . . . Apparently even the healthy did not escape, but were bled twelve times a year, on a particular day of the month, and exhaustively purged besides.

Strenuous measures were used to combat headaches, which were treated, one might say, with a vengeance:

> There is no harm in trying to cure a headache in our day. You can't do it, but you get more or less entertainment out of trying, and that is something; besides, you live to tell about it, and that is more. A century or so ago you could have had the first of these features in rich variety, but you might fail of the other once—and once would do. I quote:
>
> "A certain Merchant, about forty years of Age, of a Melancholic Habit, and deeply involved in the Cares of the World, was during the Dog-days, seiz'd with a violent pain of his Head, which some time after oblig'd him to keep his Bed.
>
> "I, being called, order'd Venesection in the Arms, the Application of Leeches to the Vessels of the Nostrils, Forehead, and Temples, as also to those behind his Ears. I likewise prescrib'd the Application of Cupping-glasses, with Scarification, to the Back. But notwithstanding these precautions, he dy'd. If any Surgeon, skill'd in Arteriotomy, had been present, I should also have order'd that Operation."

"Now that we know," was Mark's biting commentary, "what this butcher did to relieve a *Head-ach*, it is no trouble to infer that if he wanted to comfort a man that had a *Stomach-ach* he disemboweled him."

Mysticism received its due measure of disapproval:

"They liked a touch of mystery along with their medicine in the olden times. The medicine-man of that day, like the medicine-man of our Indian tribes, did what he could to meet the requirement." As an example of one of the secretive and awe-inspiring "earthquakes which the old-time doctor used to introduce into his patient when he could find room," he itemized in detail, "Alexander's Golden Antidote," a patent medicine built up of seventy-three *odd* drugs, and "good for—well, pretty much everything."

The signature, he added, should have read: "Serve with a shovel."

This shot-gun system was soon superseded by another extreme form of practice:

> When you reflect that your father had to take such medicines as the above, and that you would be taking them yourself but for the introduction of homeopathy, which forced the old-school doctor to stir around and learn something of a rational nature about his business, you may honestly feel grateful that homeopathy survived the attempts of the allopathists to destroy it even though you may never employ any physician but an allopathist while you live.

From several important standpoints "A Majestic Literary Fossil" is worthy of careful perusal.

Prescription Writing. The doctor casually scribbled off a prescription:[13]

> It was one of Galen's; in fact it was Galen's favorite, and had been slaying people for sixteen hundred years. Galen used it for everything, applied it to everything, said it would remove everything from warts all the way through to lungs, and it generally did. Galen was still the only medical authority recognized in Missouri; his practice was the only practice known to the Missouri doctors; and his prescriptions were the only ammunition they carried when they went out for game.

A Note on Opium. His brother was dying of burns, in 1858.[12] The doctor left word that the young medical student in charge at night should give an eighth of a grain of morphine, if the patient were restless.

Along toward midnight Mark thought that the sedative ought to be given. But it was a new drug then, he related, and the student was reluctant to use it.

"I have no way of measuring it. I don't know how much an eighth of a grain would be."

"If you have studied drugs you ought to be able to judge how much an eighth of a grain would be," Mark urged.

The student finally yielded and "ladled out, in the old-fashioned way, on the point of a knife-blade, what he believed to be the right amount."

Female Medical Education. One is afforded here[14] an interesting glimpse of the early days of the woman physician:

> The [Woman's] College, in 1870, was a small one, and it sustained itself not without difficulty in this city [Philadelphia], which is so conservative, and is yet the origin of so many radical movements. There were not more than a dozen attendants on the lectures altogether, so that the enterprise had the air of an experiment for those engaged in it. There was one woman physician driving about town in her carriage, attacking the most violent diseases in all quarters with persistent courage, like a modern Bellona in her war-chariot, who was popularly supposed to gather in fees to the amount of ten or twenty thousand dollars a year. Perhaps some of the students looked to the near day when they would support such a practice, and a husband besides. But it is unknown that any of them went further than practice in hospitals and their own nurseries, and it is feared that some of them were quite as ready as their sisters, in emergencies, to "call a man."

The Vagaries of Therapeutics

The Stability of Medicine. This undoubtedly is his rational and more composed opinion of the doctor in contradistinction to his subsequent heated indictments:[16]

> To heal the body of all its ills and pains is a mighty benefaction, but in our day our physicians and surgeons work a thousand miracles—prodigies which would have ranked as miracles fifty years ago—and they have so greatly extended their domination over diseases that we feel so well protected that we are able to look with a good deal of composure and absence of hysterics upon the claims of new competitors in that field.

Osteopathy. He had many kind words for this system, and at one time inclined very favorably towards it:[3]

"Dr. Still in the middle of Kansas, in a village, began to experiment in 1874, only five years after Kellgren began the same work obscurely in the village of Gotha, Germany." This refers to Heinrich Kellgren, who practiced Swedish movements originally in Sanna, Sweden, as the precursor of Osteopathy. By the time Still began to experiment, Kellgren had completed the development of the principles of his system, and established himself in good practice in London. He continued:

> I was greatly surprised to find that this new science was well known in America under the name of Osteopathy. Since then (1900), I find that in the past three years it has got itself legalized in fourteen states in spite of the opposition of the physicians; that it has established twenty Osteopathic schools and colleges; that among its students are seventy-five allopathic physicians; that there is a school in Boston and another in Philadelphia; that there are about seven hundred students in the parent college (Dr. Still's at Kirksville, Missouri); and that there are about two thousand graduates practicing in America.

In 1899 he wrote, in a prophetic vein that was to prove disastrous:[3]

> Ten years hence no sane man will call a doctor except when the knife must be used—and such cases will be rare. The educated physician will himself be an osteopath . . . I do not believe there is any difference between Kellgren's science and Osteopathy. I want Osteopathy to prosper; it is common sense and scientific, and cures a wider range of ailments than the doctor's method can reach.

What bizarre cults would he, in his therapeutic enthusiasm, be lauding to-day?

Christian Science. William Dean Howells said:

> He allowed the miracles of its healers to be tried on his family if they wished it. He had a tender heart for the whole generation of empirics, as well as the newer sorts of scienticians, but he seemed to base his faith in them largely upon the failures of the regulars, rather than upon their own successes, which also he believed in. He was recurrently, but not insistently, desirous that you should try their strange magic when you were going to try the familiar medicines.

According to his Boswell, Paine, he never had any quarrel with Christian Science or mental healing, or with the empirics, but acknowledged the good in them and welcomed most of them in preference to materia medica. His contention with Mary Baker Eddy lay in the conviction that she was "a very unsound Christian Scientist herself," and that she suffered from a "serious malady—self-edification."

His book entitled "Christian Science" is a vigorous arraignment of that pseudo-scientific system. His also wrote a sketch, as yet unpublished, called "Eddypus," an imaginary history of the world a thousand years hence, when Eddyism should rule supreme over all.

And yet despite his harsh words he could not but feel[3] that:

> Christian Science is humanity's boon. Mother Eddy . . . has organized and made available a healing principle that for two thousand years has never been employed, except as the merest kind of guesswork . . . Many an ass in America is getting a good deal of benefit out of Christian Science's new exploitation of an age-old healing principle—faith, combined with the patient's imagination.

Although, as he felt sure, Mrs. Eddy stole the idea originally from one Phineas Parkhurst Quimby, a healer of sorts who had treated her in the early days for hysterical paralysis, yet "its healing principle (its most valuable asset) possesses the same force now that it possessed a million years ago before Quimby was born."[3]

He was strongly impressed with the worth of psychotherapy:

> The mind cannot heal broken bones, and doubtless there are other physical ills which it cannot heal, but it can greatly help to modify the severities of them all without exception, and there are mental and nervous ailments which it can wholly heal without the help of physician or surgeon.[3]

And again:

> No one doubts that the mind exercises a powerful influence over the body. From the beginning of time, the sorcerer, the interpreter of dreams, the fortune-teller, the charlatan, the quack, the wild medicine-man, the educated physician, the mesmerist, and the hypnotist have made use of the client's imagination to help in their work . . . Many faithcures probably do no harm, since they do not forbid the patient to help out the cure with medicines if he wants to; but the others bar medicines, and claim ability to cure every conceivable human ailment through the application of their mental forces alone. There would seem to be an element of danger here. It has the look of claiming too much, I think.[16]

Nostrums. The visionary Colonel Sellers, who was always chasing new enterprises, enthusiastically took a flyer in the therapeutic field:[14]

> I've been experimenting on a little preparation for curing sore eyes—a kind of decoction nine-tenths water and the other tenth drugs that don't cost more than a dollar a barrel . . . Before many weeks I wager the country will ring with the fame of Beriah Seller's Infallible Imperial Oriental Optic Liniment and Salvation for Sore Eyes—the Medical Wonder of the Age! . . . It's a patent medicine whose field of operations is the solid earth.

Tom Sawyer's aunt[15] was described as follows:

> [She was] one of those people who are infatuated with patent medicines and all new-fangled methods of producing health or mending it . . . Whenever something fresh in this line came out she was in a fever, right away, to try it, not on herself, for she was never ailing, but on anybody else that came handy. She was a subscriber for all the "Health" periodicals and phrenological frauds; and the solemn ignorance they were inflated with was breath to her nostrils. All the "rot" they contained was gospel to her . . . She gathered all her quack periodicals and her quack medicines, and thus armed with death, went about on her pale horse, metaphorically speaking, with hell following after. But she never suspected that she was not an angel of healing and the balm of Gilead in disguise, to the suffering neighbors.

Eclecticism. He had liberal ideas on the subject of specialization:[3]

> My notion is, that no art of healing is the best for *all* ills. I should distribute my ailments around; surgery cases to the surgeon; lupus to the actinic-ray specialist; nervous prostration to the Christian Scientist; most ills to the allopath and the homeopath; and (in my own particular case) rheumatism, gout, and bronchial attacks to the osteopath.

Medical Pessimism. Perhaps here, more than anywhere else, does he reveal his tendency to both praise and condemn in an inconsistent fashion:[3]

> We do not guess, we know that nine in ten of the species are pudd'nheads. We know it by various evidences; and one of them is, that the race has respected (and almost venerated) the physican's grotesque system—the emptying of miscellaneous and harmful drugs into a person's stomach to remove ailments which in many cases the drug could not reach at all; in many cases could reach and help, but only at cost of damage to some other part of the man; and in the remainder of the cases the drug either retarded the cure, or the disease was cured by nature in spite of the nostrums. The doctor's insane system has not only been permitted to continue its follies for ages, but has been protected by the State and made a close monopoly —an infamous thing, a crime against a freeman's right to choose his own assassin or his own method of defending his body against disease or death.
>
> And yet at the same time, with curious and senile inconsistency, the State *has* allowed the man to choose his own assassin—in one detail—the patent-medicine detail—making itself the protector of that particular business, collecting money out of it, and appointing no committee of experts to examine the medicines and forbid them when they are dangerous.
>
> I have by me a list of fifty-two human ailments—common ones—and in this list [which he unfairly omits to give] I count nineteen which the physician's art cannot cure. But there isn't one which Osteopathy or Kellgren cannot cure if the patient comes early.
>
> Fifteen years ago I had a deep reverence for the physician and the surgeon. But six months of closely watching the Kellgren system has

revolutionized all that, and now I have neither reverence nor respect for the physician's trade and scarcely any for the surgeon's. I am convinced that of all quackeries, the physician's is the grotesquest and the silliest. And they know they are shams and humbugs. They have taken the place of those "augurs who couldn't look each other in the face without laughing."

From these diversified (and highly seasoned) notes on the vagaries of therapeutics it is evident that the attitude of Mark Twain on medicine was as uncertain as that of a weather-vane in March.

Medicine and Religion. Speaking of the cultivation of blind faith in times of stress, he said:[3]

> We do not *trust in God*, in the important matters of life, and not even a minister of the Gospel will take any coin for a cent more than its accepted value because of that motto. If cholera should reach these shores we should probably pray to be delivered from the plague, but we would put our main trust in the Board of Health.

And apropos of Christian Science:[16] "It is a fine thought, marrying religion to medicine, instead of medicine to the undertaker in the old way; for religion and medicine properly belong together, they being the basis of all spiritual and physical health."

THE QUALITY OF THE DOCTOR

The Well-Informed Physician. There is much truth behind this observation:[14]

> Whether medicine is a science, or only an empirical method of getting a living out of the ignorance of the human race, there are other things one needs to know quite as much as that which is taught in medical books . . . Does your doctor know anything—I don't mean about medicine, but about things in general, is he a man of information and good sense? If he doesn't know anything but medicine the chance is that he doesn't know that.

The Woman Physician. A beautiful woman has a fortune waiting her in medicine, according to him:[14]

> Medicine is particularly women's province. The treatment of disease is a good deal a matter of sympathy. A woman's intuition is better than a man's. Nobody knows anything, really, you know, and a woman can guess a good deal nearer than a man . . .
>
> But I should want to choose my doctor. An ugly woman would ruin me; the disease would be sure to strike in and kill me at the sight of her. I think a pretty physician, with engaging manners, would coax a fellow to live through almost anything.

MEDICAL WIT

He was afflicted at times with carbuncles, hence the following gem was founded on self-knowledge:[4] "The dictionary says a carbuncle is a kind of jewel. Humor is out of place in the dictionary . . . I wish I had been born with false teeth and a false liver and false carbuncles. I should get along better."

He made an interesting contribution to the study of helminthology:[4] "In Australia is prevalent a horrible disease due to an 'unperfected tape-worm.' Unperfected—that is what they call it. I do not know why, for it transacts business just as well as if it were finished and frescoed, and gilded, and all that."

A publisher sent him a book for criticism, which was composed of mistakes made by school-children in their examination papers. He quoted several elucidating examples:[18]

> Physillogigy is to study about your bones stummick and vertebry.
>
> We have an upper and lower skin. The upper skin moves all the time and the lower skin moves when we do.
>
> The body is mostly composed of water and about one half is avaracious tissue.
>
> The stomach is a small pear-shaped bone situated in the body.
>
> The gastric juice keeps the bones from creaking . . . The salivary glands are used to salivate the body.
>
> In the stomach starch is changed to cane sugar and cane sugar to sugar cane.

Rumor had spread that he was dying. To counteract it he wrote to the press:[12] "The report of my death is greatly exaggerated."

A similar false notion became current when he was seventy-four. This time he retaliated with:[7] "I would not think of doing such a thing at my age."

There is more than a grain of truth in these jests:[4]

> The Autocrat of Russia possesses more power than any other man in the earth; but he cannot stop a sneeze.
>
> He had much experience of physicians, and said "the only way to keep your health is to eat what you don't want, drink what you don't like, and do what you'd druther not."
>
> If there is one thing in the world that will make a man peculiarly and insufferably self-conceited, it is to have his stomach behave itself the first day at sea, when nearly all his comrades are sea-sick.
>
> Do not undervalue the headache. While it is at its sharpest it seems a bad investment; but when relief begins, the unexpired remainder is worth $4 a minute.

He told of a certain doctor who excused himself from his guests in this style when he had to leave to make an impromptu call:[3] "Entertain yourself while I go out and reduce the population."

He was constantly receiving prescriptions and remedies in the mail whenever the papers reported that he was suffering from one of his frequent bronchial or rheumatic attacks. He would answer routinely:[3] "Dear Sir (or Madam)—I try every remedy sent to me. I am now on No. 87. Yours is 2,653. I am looking forward to its beneficial results."

He had prepared notes on a story, as yet unprinted, "in which the various characters were to have a weird, pestilential nomenclature; such as 'Lockjaw Harris'; 'Influenza Smith'; 'Sinapism Davis'; and a dozen or two more, a perfect outbreak of disorders."[12]

Another unfinished work, entitled: "3,000 Years among the Microbes," was intended to be a scientific revelry, a satire like "Gulliver's Travels," in the form of an autobiography of a microbe that had once been a man and through the failure of a biological experiment was transformed into a cholera germ.[12]

Speaking of Christian Science testimonials, he solemnly declared:[16] "Milk leg is cured; nervous prostration is cured; consumption is cured; and St. Vitus Dance is made a pastime. Even without a fiddle."

He sounded a curious note of praise regarding an *important* article of diet:[14]

> Turnips are mighty sustaining—brimful of nutriment—all the medical books say so. Just eat from four to seven good-sized turnips at a meal, and drink from a pint and a half to a quart of water, and then just sit around a couple of hours and let them ferment. You'll feel like a fighting cock the next day.

He once fell off a cliff, and when he was picked up, he was[16] "an incoherent series of compound fractures extending from the scalplock to the heels, and the comminuted projections caused him to look like a hatrack."

On another occasion the doctor, "with scientific relish," presented this diagnosis:[13]

> Without going too much into detail . . . I concede that great care is going to be necessary here; otherwise exudation of the oesophagus is nearly sure to ensue, and this will be followed by ossification and extradition of the maxillaris superioris, which must decompose the granular surfaces of the great infusorial ganglionic system, thus obstructing the action of the posterior varioloid arteries, and precipitating compound strangulated sorosis of the valvular tissues, and ending unavoidably in the dispersion and combustion of the marsupial fluxes and the consequent embrocation of the bicuspid populo redax referendum rotulorum.

His five-day old son had summarily attained a ponderous philosophy:[3] "Life seems a serious thing, what I have seen of it—and my observation teaches me that it is made up of hiccups, unnecessary washings, and colic."

MEDICAL PHRASE AND FIGURE

This analogy strikes hard and true:[7]

"He had not even income enough to enable him to live as respectable as a third-rate physician."

Concerning the difficulty a certain person had in grasping an important concept, he stated:[7]

"A cancer of old habit and long experience could as easily understand the suggestion that it board itself awhile."

His biceps muscle was being examined by an expert who was to teach him to ride the bicycle:[23]

"It is pulpy, and soft, and yielding, and rounded; it evades pressure and glides from under the fingers; in the dark a body might think it was an oyster in a rag. But you needn't worry about that; in a little while you can't tell it from a petrified kidney."

The following figures of imagery are appropriate as well as expressive:

He has "no more sex than a tapeworm."[7]

"He had teeth which made his mouth look like a neglected churchyard."[4]

The atmosphere of the town "was as languid as a consumptive girl."[24]

The supposed horrors of the study of human anatomy were mitigated in this fashion:[14]

> She began her anatomical practice upon detached portions of the human frame, which were brought into the demonstrating room—dissecting the eye, the ear, and a small tangle of muscles and nerves—an occupation which has not much more savor of death in it than the analysis of a portion of a plant out of which the life went when it was picked up by the roots.

How vivid does he make his analogies! The following are strongly descriptive:

> A great Indian river at low water suggests the familiar anatomical picture of a skinned human body, the intricate mesh of interwoven muscles and tendons to stand for water-channels, and the archipelagoes of fat and flesh inclosed by them to stand for the sandbars.[4]
>
> I dreamed that the visible universe is the physical person of God; that the vast worlds that we see twinkling millions of miles apart in the fields of space are the blood corpuscles in His veins; and that we and the other creatures are the microbes that charge with multitudinous life the corpuscles.[4]

One would have to look far for a more skillful dissection of the mechanism of the emotions:[20]

> There are nerves and muscles in our frames whose functions and whose methods of working it seems a sort of sacrilege to describe by cold physiological and surgical technicalities . . . Fancy a surgeon, with his nippers lifting tendons, muscles, and such things into view, out of the complex machinery of a corpse, and observing, "Now this little nerve quivers—the vibration is imparted to this muscle—from here it is passed to this fibrous substance; here its ingredients are separated by the chemical action of the blood—one part goes to the heart and thrills with what is popularly termed emotion; another part follows this nerve to the brain and communicates intelligence of a startling character—the third part glides along this passage and touches the spring connected with the fluid receptacles that lie in the rear of the eye. Thus, by this simple and beautiful process, the party is informed that his mother is dead, and weeps."

MEDICAL QUOTATIONS

These quotations are from chapter headings in "The Gilded Age." One of the leading female characters in this novel is a medical student, which accounts for the references:[4]

> She, gracious lady, yet no paines did spare
> To doe him ease, or doe him remedy:
> Many restoratives of vertues rare
> And costly cordialles she did apply,
> To mitigate his stubborn malady.
> Spencer's "Faerie Queene."
>
> It would be some humanity to stand
> His dutiful physician! What delight
> Would it not be to lay thy healing hand
> Upon the young man's breast!
> Tasso's "Jerusalem Delivered."

I think the healing art ought to be based on reason to be sure, and too that it should be founded on unmistakable evidences, all uncertainties being rejected, not from the serious attention of a physician, but from the very profession itself.

Celsus.

THE HERITAGE OF MAN

Disease. According to Satan:[25] "Man is a museum of diseases, a home of impurities." And from the standpoint of evolution, he is indeed a sorry specimen:[12]

> Man starts in as a child and lives on diseases to the end as a regular diet. He has mumps,

measles, whooping cough, croup, tonsillitis, diphtheria, scarlet fever, as a matter of course. Afterward, as he goes along, his life continues to be threatened at every turn by colds, cough, asthma, bronchitis, quinsy, consumption, yellow fever, blindness, influenza, carbuncles, pneumonia, softening of the brain, diseases of the heart and bones, and a thousand other maladies of one sort and another. He's just a basketful of festering, pestilent corruption, provided for the support and entertainment of microbes. Look at the workmanship of him in some of its particulars. What are his tonsils for? They perform no useful function; they have no value. They are but a trap for tonsillitis and quinsy. And what is the appendix for? It has no value. Its sole interest is to lie and wait for stray grape-seeds and breed trouble . . .

Man's sight and smell and hearing are all inferior. Think of man—that poor thing!—the animal of the wig, the ear-trumpet, the glass eye, the porcelain teeth, the wooden leg, the trepanned skull, the silver wind-pipe—a creature that is mended and patched all over from top to bottom.

He's the poorest, clumsiest excuse of all the creatures that inhabit this earth. He has got to be coddled and housed and swathed and bandaged and upholstered to be able to live at all.

Death. Scientific burial is still far in the distant future:[4] "We are drifting slowly—but hopefully towards cremation in these days . . . When cremation becomes the rule we shall cease to shudder at it; we should shudder at burial if we allowed ourselves to think what goes on in the grave."

And despite man's bitter heritage, he clings sturdily to the very end:[4] "Each person is born to one possession which outvalues all his others—his last breath."

The following paraphrase of the Rubaiyat discloses the pessimistic mood into which he often fell:[26]

From Cradle unto Grave I keep a House
Of Entertainment where may drouse
Bacilli and kindred Germs—or feed—or breed
Their festering Species in a deep Carouse.

Think—in this battered Caravanserai,
Whose Portals open stand all Night and Day,
How Microbe after Microbe with his Pomp
Arrives unasked, and comes to stay.

Our Ivory Teeth, confessing to the Lust
Of Masticating, once, now own Digust
Of Clay-plug'd Cavities—full soon our Snags
Are emptied, and our Mouths are filled with Dust.

Our Gums forsake the Teeth, and tender grow,
And fat, like over-ripened Figs—we know
The Sign—the Rigg's Disease is ours, and we
Must list this Sorrow, add another Woe;

Our Lungs begin to fail, and soon we Cough,
And chilly Streaks play up our Backs, and off
Our fever'd Foreheads drips an icy Sweat—
We scoffed before, but now we may not scoff.

So let me grateful drain the Magic Bowl
That medicines hurt Minds and on the Soul
The Healing of its Peace doth lay—if then
Death claims me—welcome be his Dole.

And the dole that finally did come to him was[17] "the sweet placidity of death . . . more beautiful than sleep." Long-suffering and long-enduring,[28,29] to him such a blessing was deserving, no less than welcome.

His life today is more than a memory; his works are imbued with the enviable quality of durability. And not the least of the products of his pen is the Medicana of Samuel Langhorne Clemens.

REFERENCES

1. The Memorable Assassination.
2. A New Crime.
3. Letters.
4. Following the Equator.
5. What is Man?
6. Mental Telegraphy.
7. Autobiography.
8. At the Appetite Cure.
9. A Tramp Abroad.
10. Curing a Cold.
11. A Majestic Literary Fossil.
12. Biography.
13. Those Extraordinary Twins.
14. The Gilded Age.
15. The Adventures of Tom Sawyer.
16. Christian Science.
17. The Death of Jean.
18. English as She Is Taught.

19. A Double-Barrelled Detective Story.
20. The Innocents Abroad.
21. Sketches.
22. Pudd'nhead Wilson.
23. Taming the Bicycle.
24. Roughing It.
25. The Mysterious Stranger.
26. My Boyhood Dreams.
27. Experience of the McWilliamses with Membranous Croup.
28. Brooks, Van W. The Ordeal of Mark Twain.
29. O'Higgins, H., and Reede, E. H. M.D., The American Mind in Action. Chap. 2, in Mark Twain.

A POEM IN PRAISE OF OPHTHALMOLOGISTS

People usually forget about the doctor until they need his services, but most people who have to use their eyes much are, at least, grateful to the men who have saved them from whole or partial blindness on occasion. Of all the poems in praise of our profession which I have patiently perused and segregated, I know of only one in praise of these physicians. It is by Theodor Storm, one of the German novelists of the Romantic Period, the Storm whose "Immensee" we read in the High School as children. He is a writer of rare grace and charm, and of the group which includes Ebner Eschenbach, Rudolf Lindau, Fanny Lewald, Louise von François, Theodor Fontane, writers of the romantic German past, distinguished not so much by cynical knowledge of the brutalities of existence as by genuine depth of thought and feeling. The charm of Theodor Storm is that like Turgenieff, he seems ever hovering on the verge of the great secret. The little poem runs as follows:

BLUMEN

(Dem Augenarzt von seinen Kranken).

Sie kommen aus dem Schoss der Nacht:
Doch wären unten sie geblieben,
Wenn nicht das Licht mit seiner Macht
Hinauf ins Leben sie getrieben.

Holdselig aus der Erde bricht's,
Und blüht nun über allen Schranken;
Du bist der Freund des holden Lichts:
Lass dir des Lichtes Kinder danken!

Which I render into the following bald verses:

FLOWERS

Imprisoned in the womb of night,
They lived afar from warmth and love,
Until the spell of kindly light
Released them to the world above.
In fragrance now they bloom, despite
The ugliness their charms displace;
Thou art the friend of heavenly light:
Light's children thank thee, of their grace.

F. H. GARRISON, M. D.

[From Wirzung: General Practise of Physicke, London, 1605]

EDITORIALS

THE SCAMNUM HIPPOCRATIS

C. J. S. Thompson, M.B.E., has written a most interesting description[1] of a recently discovered scamnum, or table used for the reduction of dislocations. The table, which is now in the Wellcome Historical Medical Museum in London, was discovered in the old monastery of Permabilli, some sixteen miles from Urbino in Italy, where it had been fixed up for use in the refectory. Thompson has restored it to its original condition and describes it as having a solid top of walnut, 1½ inches thick. It measures 7 feet long by 2 feet, 4 inches wide. The four corner-posts are fitted with iron cogs, controlling the winding bars which connect each pair of corner-posts. These are controlled by pins which act as brakes that can be inserted when required. Down the center of the top are eleven square holes, 2 inches wide by 1½ inches in depth. The top is solid and in one piece, supported by four legs. At either end are iron staples, which are supposed to have been used as stanchions to prevent the table from slipping. He believes the table is similar to that described by Oribasius, and first depicted in a manuscript by Nicetas, a Byzantine doctor of the tenth century, which is now in the Laurentian Library at Florence. It was afterwards described and represented in the translation of this manuscript by Guido Guidi, in Florence, about 1540. As Thompson says, this table may be said to be a direct descendant of the Scamnum of Hippocrates, and it is so called by Guido Guidi, who reproduces it in a wood-cut in the first edition of his "Chirurgia e Graeco in Latinum a se conversa," printed in Paris in 1544. As the monastery where this recently discovered table was found is within fifty miles of Florence, which was Guido Guidi's native town and where he passed most of his life, Thompson thinks that it may have been made in his lifetime, and was possibly constructed under his direction.

Sir D'Arcy Power, K.B.E., F.R.C.S., deals with the classical descriptions of the Scamnum. It was in great vogue among the Greeks because fractures and dislocations occurred so frequently during their wrestling matches. The apparatus in its simplest form dates so far back as to be antecedent to the use of the screw as a mechanical power. The lever, the crank, the windlass and the pulley are employed, but the screw is conspicuous by its absence. It seems to have varied little in construction from the time of Hippocrates to that of Guido Guidi, for the latter's description is the same as that contained in the Hippocratic writings.

Many interesting illustrations accompany this most valuable contribution to our knowledge of a famous but long disused surgical appliance.

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[1] *Proc. Roy. Soc. Med.*, Lond., 1925, XVIII, Sect. Hist. Med.

BOOK REVIEWS

Early Science in Oxford. By R. T. Gunther. Vol. iii. Part i. The Biological Sciences. Part ii. The Biological Collections. Oxford, Printed for the Subscribers, 1925.

All those interested in the history of science are, or should be, familiar with the important material already published by the author of this volume. The importance of the contributions to science which have originated in Oxford throughout the centuries of its existence is so great that when told consecutively the relation makes an imposing record. Such a work as Gunther has undertaken is no mere display of local pride. It is a contribution of the greatest value to the history of science at large. Should other institutions, such as the Sorbonne or some of the ancient Italian universities, be so fortunate as to possess a historian equally competent with Gunther, our knowledge of the progress of ideas and the origin of discoveries would be placed on a much more satisfactory basis. Gunther's method could hardly be improved on.

The first chapter reviews all that is known of medicine at Oxford down to the seventeenth century from St. Frideswide, who died in 732 and who cured miraculously with water in which she had washed her hands.

Oxford boasted of at least two most distinguished physicians in the fourteenth century: Nicholas Tynchewyke, Fellow of Balliol, who was physician to Edward i and the first lecturer on medicine, and John Gaddesden of Merton who wrote the "Rosa Medicinae," a much admired medical work. Gunther describes the "Zodiac Men" who are figured in various manuscripts at Oxford, and the "Urine Rings" of which there are several in the Ashmolean Museum. The latter are tabulated in a circular form which gives a diagrammaticre presentation of the diseases associated with various appearances to be seen in the urine. He gives the picture of the statue, dating from 1606, of a doctor of medicine on a buttress of the cloisters of Magdalen College, which represents him performing uroscopy. Linacre's Foundation did much for medicine at Oxford. On several occasions Queen Elizabeth was entertained when visiting Oxford with a "disputation in Physick." On September 5, 1566, the performance lasted "from two of the clock or thereabouts until seaven, before the Queen's Majesty; who gave fery attent care unto them and tarryed till the full end thereof." The seventeenth century was a glorious one in the history of Oxford. Early in it King James i endowed the regius professorship of medicine, the first occupant of which was Richard Clayton, first of a line of the most distinguished names in the profession. His successor, Sir William Petty, wrote the Survey of Ireland, the manuscript of which was so fortunately recovered by his successor in the regius professorship, Sir William Osler, and by him presented to the Library of Trinity College, Dublin. Among Clayton's pupils were Sir Thomas Browne and George Joyliffe, to whom many ascribe the discovery of the lymphatics. At Oxford in this century we find Kenelm Digby, that half-cracked imposter; but greater than all were William Harvey and Thomas Sydenham. Among Sydenham's pupils were Sir Hans Sloane, founder of the British Museum, and Thomas Dovar or Dover, the buccaneer and inventor of the powder which bears his name. To Robert Boyle's chemical investigations medicine owes much. The name of Thomas Willis of Christ Church College is chiefly commemorated in the arterial system in the brain. His great work on the anatomy of the brain was illustrated by Sir Christcpher Wren. Willis also was the discoverer of saccharine diabetes. John Locke and Richard Lower were of the Oxford group. Gunther gives some information not generally known concerning John Radcliffe, the great benefactor of Oxford and the first owner of the Gold-headed Cane. John Freind, the earliest Englishman to write a systematic history of medicine, was of Christ Church. Chapter iii deals with Anatomy as studied and taught at Oxford, and of the discoveries and advances made in that science by Oxford men. It was not until the beginning of the seventeenth century that the study of Anatomy was really developed at Oxford, but it flourished from the very outset. It is claimed that George Joyliffe had observed and demonstrated the lymphatic system, but his discovery was not published when Rudbeck in 1651 described it, and Nathaniel Highmore, Richard Lower and Thomas Willis were men whose anatomical researches were of the utmost importance. Sir Christopher Wren as mentioned above made the anatomical drawings for the Anatomy of Thomas Willis. Wren had been Sir Charles Scarborough's assistant in making anatomical preparations for his demonstrations at Surgeon's Hall. Later, at the request of King Charles II, he made a series of drawings of insects as seen through a microscope. Gunther gives the method which the distinguished architect had devised in his early years by which he removed the spleen with safety from living dogs. Wren first "exactly measured and delineated the spheres of the humours of the eye, whose proportions were only guessed at before." When Wren turned his energies to architecture, anatomy sustained a serious loss. Wren suggested to Boyle no later than 1656: "To ligature the veins of the living animal open them on the side of the ligatures nearest the heart, and inject with 'slender syringes or quills fastened to bladders' . . . and they hope likewise, that beside the medical uses, that may be made of this invention, it may also serve for anatomical purposes, by filling, after this way, the vessels of an animal as full as they can hold, and by exceedingly distending them, discover new vessels." Thus although arterial injections have been usually regarded as an invention of the Dutch anatomists, we see that those at Oxford anticipated them. Robert Boyle, the physicist, discovered the method of preserving organic preparations in alcohol, and he certainly was the first to suggest the injection of some semi-solid substance, such as "the liquid plaister of burnt Alabaster, formerly mentioned, or ising-glass steeped two days in water," into the vessels to facilitate their dissection. This is believed to be the first mention of an injection medium which would solidify like wax. In fact so actively did the anatomists of Oxford pursue their researches that they were made the butt of various sarcasms and caricatures intimating that their time was wasted on cats and dogs instead of more useful pursuits. Gunther pursues the history of anatomy as taught at Oxford through the eighteenth and nineteenth centuries down to the present time.

Chapter v deals with the history of Physiology as studied and taught at Oxford. John Mayow in the following words first described, with any approach to our modern conception, the respiration: "Respiration consists in the separation from the air by the lungs, and the intermixture with the blood-mass, of certain particles absolutely necessary to animal life, and the loss by the inspired air of some of its elasticity. The particles of the air, absorbed during respiration, are designed to convert the black or venous blood into the red or arterial." He also said that the placenta was the lungs of the fetus and knew that stimulation of the oculomotor nerve contracted the pupil. Willis, Lower and Wren were all physiological investigators of the first rank. Gunther goes at length into the many experiments performed by this Oxford group on the transfusion of blood from one animal to another.

The next chapter is devoted to the history of zoological science at Oxford.

In addition to relating many little-known facts concerning the contributions of various Oxford men to Zoology, there are many most fascinating illustrations accompanying the text. The work of Plot and Pennant did much for Zoology. The author of what is probably the best loved work of its character ever published, "The Natural History of Selborne," Gilbert White, was a Fellow of Oriel. Chapter VI concerns the contributions of Oxford to Botany. This ground has previously been most thoroughly covered by Gunther himself in his delightful works "Oxford Gardens" and especially "Early English Botanists." Enumerating the various collections of dried plants, dating from the early years of the sixteenth century, Gunther regretfully points to the fact that little use was made of them or of any other facilities for the study of systematic botany at Oxford until Charles Daubeny was appointed Professor of Botany in 1834. But physiologic botany was not neglected by some of the early investigators whose work in other fields has been referred to. Thus Nathaniel Highmore anticipated Morgagni by a quarter of a century in the investigations he carried on in plant morphology; Hooke first announced the "Cell Theory" as regards the structure of plants in 1667 in his "Micrographia," and Sir Thomas

Millington, Sedleian professor of natural philosophy, first suggested that the anther was the male organ of plants.

In Chapter VII Gunther sets forth the just claims of Oxford to be regarded as the cradle of Geology in England in spite of the lamentable neglect with which that science has been treated by the authorities who should have and could have done so much to further it. With William Smith, the "father of English Geology" began a new era illuminated by the names of William Buckland, Coneybeare, Lyell, Murchison and many others. In view of the recent episode at Dayton, Tennessee, it is interesting to read Gunther's account of the storm which was raised when Buckland published his "Bridgewater Treatise, Geology considered with reference to Natural Theology," in which he demolished the Mosaic story of the Creation and Flood.

A most interesting section of the book is devoted to the Collections at Oxford, including the Anatomical School, the Bodleian Library (not comprising the books and manuscripts), and the Ashmolean Museum. Of the way in which Elias Ashmole came into possession of the curious museum formed by the Tradescants and the foundation of the famous museum which bears his name, Gunther gives a fascinating narrative. Much data of interest is to be found in the section in which are included aids to study at Oxford and a consideration of the systems of scientific education in the eighteenth century.

Dr. Gunther's book is not only an invaluable work of reference but a delightful book to read. To those who read with pleasure the diaries of Pepys and Evelyn the charm of this book will make a special appeal. We hope that it will meet with the large circle of readers which it so well deserves.

FRANCIS R. PACKARD, M.D.

ERSTLINGE DER PÄDIATRISCHEN LITERATUR. Drei Wiegendrucke über Heilung und Pflege des Kindes. In Faksimile herausgegeben von Karl Sudhoff. 4°. Munich, Verlag der Münchener Drucke, 1925.

PEDIATRICS OF THE PAST, AN ANTHOLOGY. By John Ruhräh. xxv + 592 pp., 18 plates, royal 8°. New York, Paul B. Hoeber, 1925.

The simultaneous appearance of these two magnificent books evinces a lively interest in a medical specialty which, up to 1850, was almost non-existent as such. Up to 1850, pediatrics was only a phase of internal medicine, maintaining a kind of enharmonic cross-relationship with gynecology and obstetrics. The immense growth of the specialty in the last seventy-five years has been due to a number of causes, primarily the introduction (*circa* 1850) of thermometry, ophthalmoscopy and other methods of instrumental precision which enabled the practitioner to get at facts about the sick infant never before ascertainable by inspection and word-of-mouth inquiry alone. Before the days of stethoscopy, calorimetry and thermometry, pediatrics was, in fact, as helpless as the dumb infant itself. Parallel with this growth, the development of the scientific study of infant metabolism and its disorders had much to do with the social aims of infant-welfare and child study, implicit in the views of the German publicist Süssmilch, that the real wealth of a country is its native population, and the maxim of Langstein that: "Children are the most valuable asset of the state." Payne has, in fact, defined the nineteenth century as "the century of the child." For various reasons, pediatrics, the specific science of diseases of infants and children, has thriven best in France, Germany and the United States, while infant welfare, i.e. the scheme of administrative mechanisms for combatting infant mortality, originated in France and attained its most telling triumphs through the devotion of English public health officers. As the English textbooks of Walter Harris (1689), Michael Underwood (1784) and Charles West (1849) outshone any other pediatric treatises of the seventeenth, eighteenth and early nineteenth centuries respectively, the seeming neglect of pediatrics as a specialty by modern English practitioners up to very recent times seems almost unaccountable. The probable reason is that once assigned by Osler, viz., the disinclination of the average English practitioner to set up housekeeping in a specialty which seemed to take care of itself and to have no special *raison d'être* in English medical organization.

The splendid quarto just published by Sudhoff illustrated his dictum that medical history usually goes about in plain work-a-day clothes but occasionally appears, on state occasions, in the garb of a royal princess, bedecked with all her jewels. It consists of facsimile reproductions of the three earliest printed incunabula on pediatrics, viz., those of

Pietro Bagellardi (1472), Bartholomaeus Metlinger (1473) and Cornelius Roelants (1483–1484), prefaced by a learned introduction by the editor, covering fifty-two pages. This introduction, an exhaustive exegesis of the intricate relationships of these three books with the pediatric literature of classical antiquity and the contemporary manuscript literature of the Middle Ages, is an index of Sudhoff's vast knowledge of ancient and medieval medicine. The texts are beautifully reproduced, without pagination, after the early medieval custom, and preceded by twenty-three facsimile reproductions of the Gutenberg Bloodletting Calendar of 1457, the first medical publication to be set in type, and specimen pages of other fifteenth century reprints of the three basic texts. Sudhoff's book is a gorgeous keepsake which should be in every medical library.

Ruhräh's book was not only prefaced but also dedicated to the undersigned, hence will be reviewed at length in these pages by some other hand. It consists of some forty-five selections from the pediatric classics of the past, with a bibliography, nineteen portraits and fifty-two facsimile reproductions of title-pages, specimen-pages and headbands from these early works. The selection ranges from Hippocrates to the Heberdens, and concludes with an account of Meissner's bibliography of 1850, and an additional (supplementary) bibliography by Ruhräh himself. It goes without saying that the format, binding, typography, illustrations and indexing are what the medical public has been accustomed to expect and to receive from the house of Hoeber. The book will naturally and obviously appeal to the specialist in diseases of children and to the general practitioner who loves the history of his profession. But the intensely humanistic character in these extracts, as also the introductory comments of the genial editor, justifies the belief that such a volume ought to be in the hands of every follower of infant welfare, child welfare and child study as well as of the physicians and medical librarians. Had the editor given his book some such title as "The Child in Medical Literature," instead of resorting to "alliterations artful aid," in the triter title it bears, the volume would doubtless have found its way also into the hands of many a cultivated mother of children.

F. H. Garrison, m.d.

Das Deutsche Medizinische Zeitschriftenwesen seit der Mitte des 19. Jahrhunderts. By W. von Brünn, Riedel-Archiv. 1925 (Sonderheft), iv, 49 pp., 8vo. Berlin, Idra-Verlagsanstalt, 1925.

In 1867, Dr. Achille Chéreau, one of the most eminent medical historians of France, published a history of French medical journalism, giving the pedigree of the important medical periodicals up to 1850. In 1908, this was supplemented by the Chronological Index of French medical periodicals from 1679 to 1856, which Dr. Ernest Wickersheimer published in the *Bibliographie Moderne.*[1] In 1879, Dr. J. S. Billings published a study of the medical journals of the United States, along the same general lines as the Chéreau essay, and destined to be followed by the *Index Medicus* (1879), the *Index Catalogue* of the Surgeon General's Library (1880–1925), the lists of the medical periodicals of the world, arranged by countries, published in the successive first volumes of the latter (first and second series), as well as the annual lists of abbreviations of all the medical periodicals coming into the Library each successive year. A study of the life histories and pedigrees of the German medical periodicals up to the middle of the nineteenth century was published by Professor Karl Sudhoff in 1903. This has now been supplemented in turn by Dr. von Brünn's survey of German medical periodicals from 1850 to 1925. In the very brief introduction, the author admits that the total material is much too extensive to be handled adequately in a monograph of small dimensions; indeed, he regards the immense output of the last seventy-five years as too vast and complex in scope to be covered by any single man. He has, therefore, limited himself to a historical survey of all the important medical periodicals of modern Germany, arranged by subjects. The classification is ingenious, running about as follows: Periodicals relating to the status of the medical profession (*Standesblätter*); periodicals relating to the local management of medicine in Germany; literary organs of scientific societies; periodicals of general medical and scientific content; the larger weeklies; medical jurisprudence and forensic expertise; military medicine; anatomy; physiology; pathology and so on through the remaining disciplines and specialties. Each periodical listed has subjoined a brief history of one or more lines, giving the origin, publishers and successive editors of the particular journal, with dates of birth and death, wherever available. When a journal has changed its title or become absorbed by intermarriage with some other journal the fact is indicated, as also the occasional offspring of these unions. As a study of the pedigree of these journals, as well as a classified, definitive list of the medical journals of modern Germany, the pamphlet is thus invaluable, both as a source of ready reference for the medical historian and a check-list for the medical librarian. It is, in fact, a model of what should be done for all modern countries having an extensive literature of medical periodicals.

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[1] Paris, 1908, Nos. 1–3.

F. H. GARRISON, M.D.

Cum INDICE *locupletiſsimo.*

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